FOUNDRY

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AUG 1943
DET

MEMO

ull have that same smile
& satisfaction if you use
Milwaukee Molding Machines
in your foundry.
H.E.F.

That Smile of Satisfaction

Castings of Perfection

THE DEMAND FOR CASTINGS TURNS

night INTO day

Castings are required to give life and purpose to the armaments of modern war. When foundries shut down, tanks and bombers freeze on the assembly lines . . . ships sit motionless on the ways. That's why foundrymen now work night and day.

Purite, the scientific flux, is an invaluable aid in the delivery of maximum output of sound, tough gray iron and converter steel castings. In the cupola Purite prevents oxidation and reduces sulfur pick-up by the metal . . . in the ladle it removes sulfur as required to meet specifications. In both applications Purite refines the iron . . . that means stronger, cleaner castings and fewer "rejects."

Purite speeds production . . . lowers costs. Write for Mathieson Bulletin P-41 describing the different uses of Purite.

Purite

ARMY E NAVY

THE MATHIESON ALKALI WORKS (INC.)
60 EAST 42ND STREET, NEW YORK, N. Y.
(Licensee of Metallurgical Development Company, Inc.)

SODA ASH IN ITS MOST EFFICIENT FORM FOR METALLURGICAL PURPOSES

ELECTRIC FERRET

You are looking down a cylinder barrel for a 2000-h.p. aircraft engine.

Here you see the rough-machined forging. When the engine builder gets through with this forging it will be finished to precise dimensions, smooth and bright as a mirror, and extremely hard.

Such a transformation takes time and money. If the last strokes of the polishing machine should uncover injurious imperfections on the smooth inner walls of the barrel, that time and money would be wasted.

To prevent spoilage and rejections *after* machining, Bethlehem gives all Aircraft Quality steel routine representative Magnaflux tests —first when the steel is still in billet form and later (in the case of cylinder barrels) when these rough-machined forgings are ready to ship to the customer.

In principle, Magnaflux is quite simple. The sample is magnetized in a bath of light oil and iron powder, then removed and examined. Hidden flaws are instantly revealed, as the iron powder clings tightly to the surface of the steel directly above any imperfection, indicating its shape, severity, and approximate depth beneath the surface.

The Magnaflux is one of many tests applied by Bethlehem to Aircraft Quality steel. We produce steel for cylinder barrels, connecting rods, gears, cams, and bearings, as well as for dozens of other important aircraft-engine applications. Bethlehem Aircraft Quality Steels are fighting over Europe and the Mediterranean, and over the Pacific.

BETHLEHEM STEEL

Photo—Harold M. Lamb

● There's no doubt about it—speed in America's foundries will hasten America's victory.

Federal Green Bond (Wyoming bentonite) is helping hundreds of foundries to acquire that speed. Green Bond, because of its uniform grind, blends with sand thoroughly, evenly and quickly—so quickly, in fact, that it's the ideal bentonite for use with today's high-speed mullers and blenders.

After the war, these same foundries will use the same speedy Green Bond—because speed boosts profits, and Federal Green Bond is FAST. For wartime speed and peacetime profits, use

FEDERAL GREEN BOND . . .
Best of the Bentonites

FOR VICTORY
BUY UNITED STATES WAR BONDS AND STAMPS

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland, Ohio

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THE FOUNDRY

for AUGUST 1943

VOLUME 71 NUMBER 8

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London . . . . . 2, Caxton Street, Westminster, S.W. 1.

THE FOUNDRY is published monthly by THE PENTON PUBLISHING CO., Penton Building, 1213 West Third Street, Cleveland, O. EARL L. SHAFER, President and Treasurer; GEORGE O. HAYS, Vice President and FRANK G. STEINEBACH, Secretary

Subscription: In the United States and possessions, one year, $2.00, three years, $5.00. Single copies 25 cents. Copies published three months or more previous to date of current issue, 50 cents

Member: Audit Bureau of Circulations, Associated Business Papers, National Publisher's Association.

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Entered as second class matter at postoffice at Cleveland under the act of March 3, 1879.

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"One Pound or Ten Tons... Very Satisfactory . . . Never Have Core Oil Trouble"

FRANK FOUNDRIES CORPORATION

Davenport, Iowa

10 TON CASTING Ready to go — 24 Feet Long, 4 Feet Wide, 30 Inches High. Four Tons of Oil Sand, Linoil Sand, Were Used in Making this Casting. For twenty years Frank's has used

LINOIL

Says T. J. Frank, Vice-President of Frank Foundries Corporation:

"We find Linoil very satisfactory when used in our core sand mixture, because it makes no difference whether the casting weighs one pound or ten tons. It is our experience that Linoil is consistently the same, which is a very important factor. It does the work 100%. We never have core oil trouble. That is why we have used Linoil for so many years."

URGENT: Shortage of steel drums is serious. Do not hold empties. Return all empty drums promptly.

THE WERNER G.

(DIVISION OF ARCHER-

2191 WEST 110 STREET WOODBINE

There is a lot of material and man hours represented in this long beauty, loaded on trucks at Frank Foundries Corporation, Davenport, ready to be sped away for war purposes.

NO LONGER is core oil considered too expensive for large work. Experience shows that while the first cost of the mold and cores is increased by using oil, the final cost of the work is less. There is practically no swelling, shrinking nor warping of a good oil core and castings can be cast more closely to end specifications, thus eliminating much heavy grinding and finishing. The risk of breakaways and washings while pouring is cut to a minimum. Good oil cores even in huge, complicated castings can be knocked out clean in minutes compared to hours with the old binders. Many foundrymen figure the best oil is the best bet and choose Linoil. Play safe and order the best—today.

SMITH COMPANY

DANIELS - MIDLAND COMPANY)

4690 CLEVELAND, OHIO

UNIFORMLY

INSIDE AND OUT-- HARDEST SCALE--FROM POCKETS AND OPENINGS

IN 1/2 FORMER TIME

Heavy cast steel valves—from the largest to the smallest sizes made—with tough, thick walls for very high pressures—present a real tough cleaning problem. Sand, and scale from annealing, deeply embedded in deep pockets and recesses, must be removed from surfaces hard to reach.

A valve manufacturer known for his fine products throughout the world, solved this tough cleaning problem with a series of five Pangborn Air Blast Cleaning Rooms and two twenty-eight cubic foot capacity Airless ROTOBLAST Barrels.

The valves are given a rough cleaning in one of the Blast Rooms—then a second blasting in the ROTOBLAST Barrel for the thorough scouring of valve faces and interior surfaces.

Results, in the operator's words, are "the prettiest, cleanest castings you ever saw."

WORLD'S LARGEST MANUFACTURER OF BLAST

PANG

PANGBORN CORPORATION . . . . . .

CLEANED..

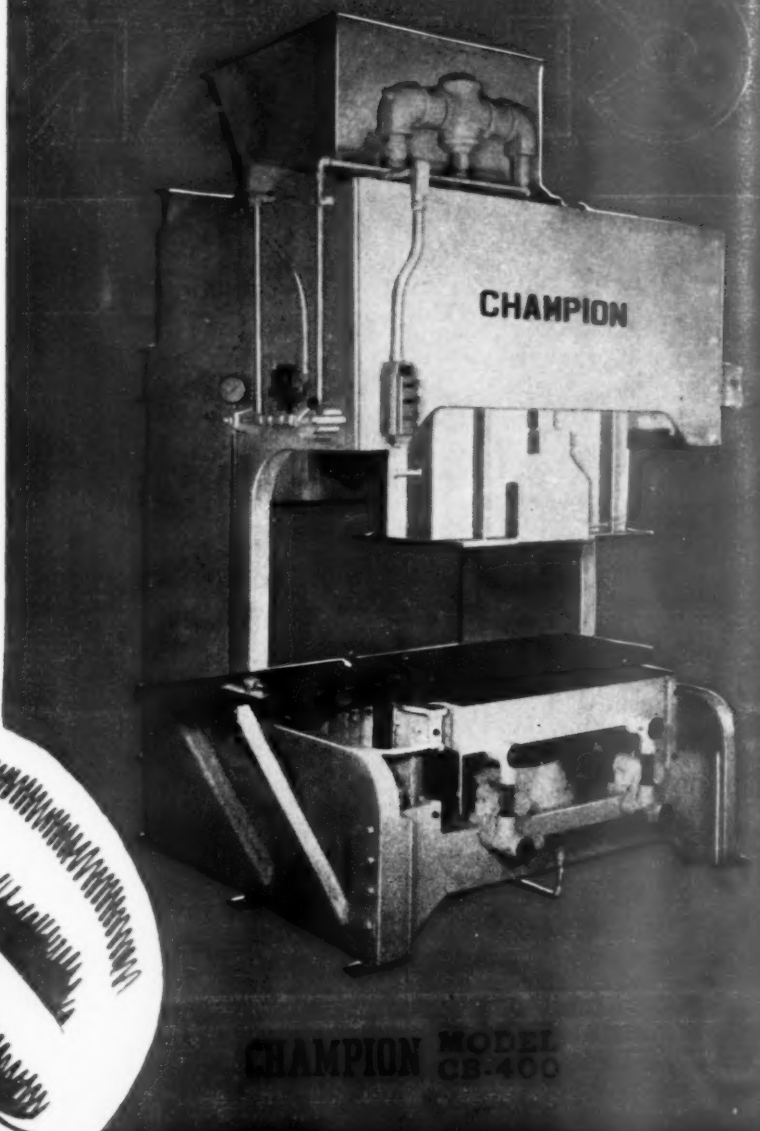
And—PRODUCTION is speeded up—COSTS are down—castings are delivered on time, UNIFORMLY CLEANED.

CLEANING AND DUST CONTROL EQUIPMENT

BORN

. . . . . HAGERSTOWN, MARYLAND

Champion core blowers

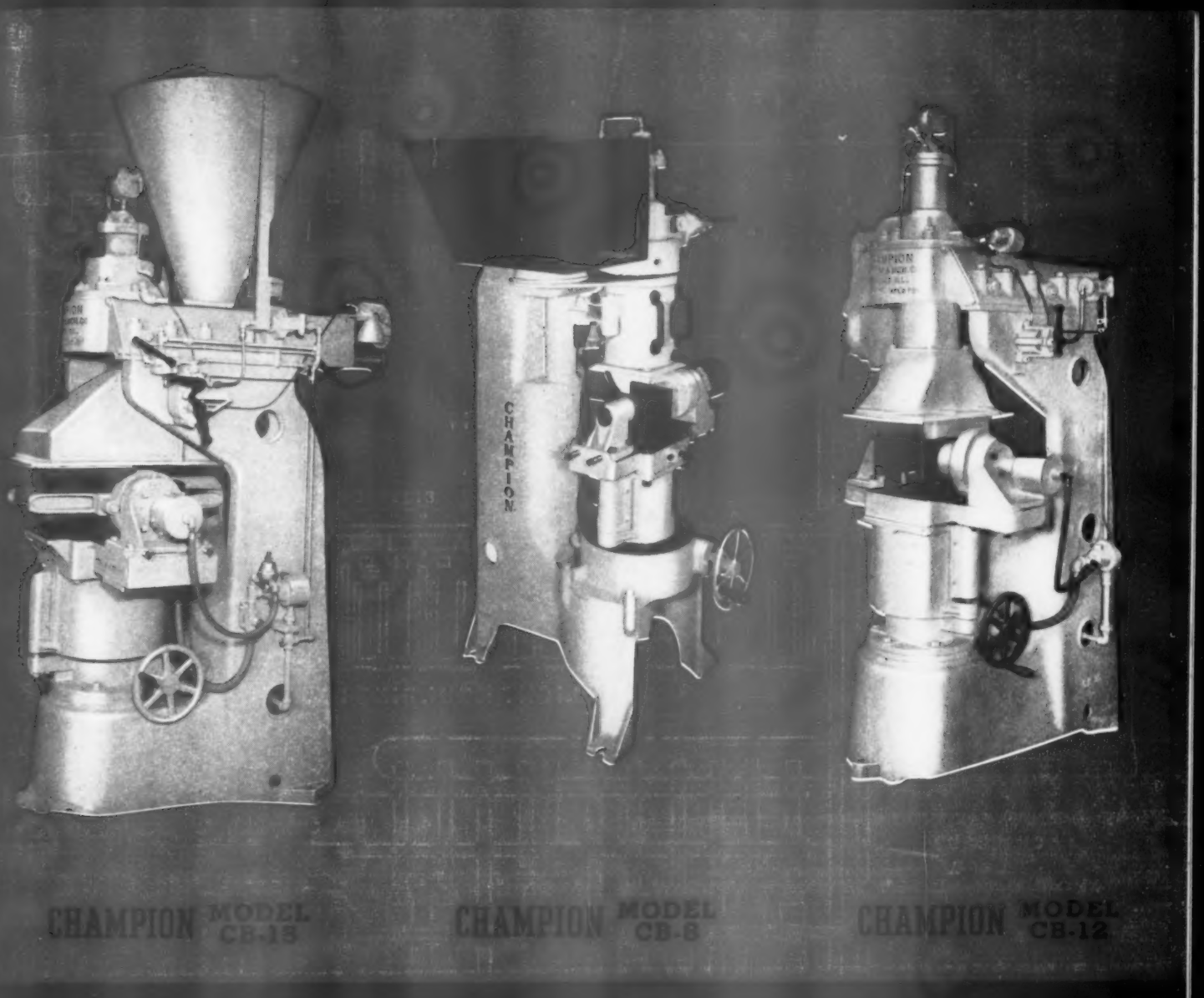


25% more blow power is delivered by Champion Core Blowers because of instantaneous blow valve action which decreases air leakage and prevents pressure dissipation. And superior power from a minimum of effort is the hallmark of a Champion in the air, on the sea or in a lonely foxhole. There is no bending, stooping or reaching when you produce your cores with a Champion Core Blower. Each model is designed in every detail to ease the burden of labor and operate with a minimum of fatigue.

Land the Knock-out Punch on Core Problems

We'll gladly tell you where

CHAMPION



The working table is completely accessible with no obstructions, so that cores are produced faster, more economically and more accurately without need for highly trained labor.

A single valve operates the core box clamp, clamps same against the blow plate, blows the core, exhausts and releases the clamps in the proper cycle. Rigid one-piece, cast steel frame insures accurate alignment of core box and blow plate. Patented Air-Operated Hydraulic Clamp locks the core box securely against split box separation.

Any man or woman can produce perfectly rammed cores on a Champion Core Blower by merely setting the box and pulling the lever. In a single second small or large cores are perfectly rammed.

Today, Champions are doing their part to hurry America's war effort. Tomorrow, those same Champions will continue to earn greater profits for their owners through faster, more accurate, more economical production of cores.

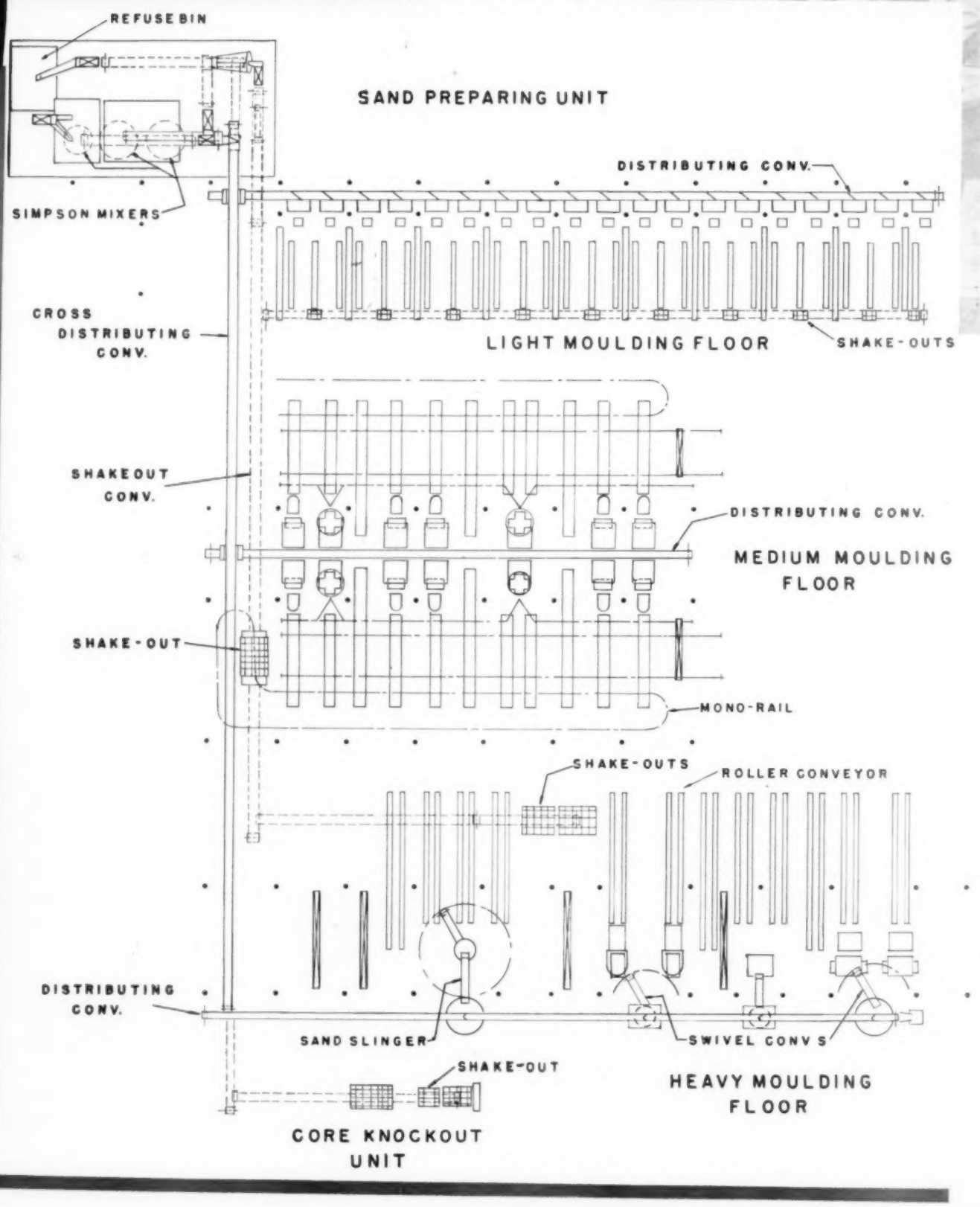
Champions may be seen in action on your kind of work

Foundry & Machine Co.

1318 W. 21st St.
Chicago, Illinois

Complete Sand Systems for MAGNESIUM FOUNDRIES

ENGINEERED



D by *National* MEANS...

High Quality Castings
Peak Production • Better Finish
Sand Control • Lower Costs

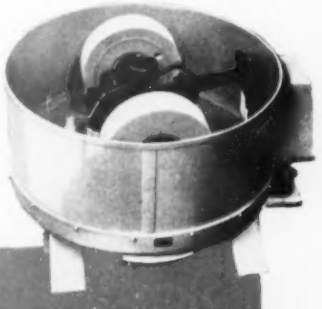
THE first magnesium castings made commercially in the United States were poured in sand mixed by Simpson Intensive Mixers. Since that day, about 15 years ago, National Engineering Company has engineered many complete sand systems for magnesium foundries. One of the most modern units is shown schematically at the left. This national System is engineered to meet the special requirements of a particular foundry. It provides for the production of light, medium and heavy magnesium castings.

The knowledge of the plant organization, together with the specialized experience of National Engineers, resulted in a simple, flexible, complete layout of equipment to permit maximum production of quality castings, with a minimum of equipment, floor space and man hours.

Sand is closely controlled to required specifications of permeability, strength and moisture, by preparation in Simpson Intensive Mixers. The very small amounts of inhibitors are uniformly distributed in each batch of sand. Batch control is obtained with a continuous flow of sand through the system, which is enclosed and exhausted to eliminate the dust hazard and to provide the best possible working conditions.

National Engineering Company has specialized in this important phase of foundry operations for more than 30 years—has played a vital part in the program to provide facilities for foundry production of war material. National in the past 2 years, has furnished complete sand preparing, sand reclaiming, sand and mold handling units for more than 50 major foundry installations for production of magnesium, aluminum, steel, heavy grey iron, malleable and non-ferrous castings.

For the shortest route to proper sand preparation, handling, storage and control, see a National Engineer. Whether it is a problem of today, or part of your long range planning, a National Engineer will gladly work it out with you.



During the past two years more than 1,000 Simpson Intensive Mixers have been installed in foundries of all types to provide properly prepared sand for the production of castings for war.

National Engineering Service **National Field Service**

For more than 30 years National Engineering and Field Service, has helped hundreds of foundries solve problems in sand preparation, reclamation, handling, storage and control. Today, National Engineers are constantly on the job helping foundries with problems of sand handling and control on construction, maintenance, repair or new requirements. National Engineering and Field Service is available and eager to help you whenever and wherever you need it.

NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries:—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

Adams Cherry Slip Flasks

—for dependable, low-cost production

Adams Cherry Slip Flasks are custom-built to your specifications, with any desired length, width or depth. Material is close-grained cherry lumber, with machined malleable trimmings.

The sand-strip mechanism is quick-acting and convenient and it will stand up under the jolting and squeezing of power machines.

Pins to suit your preference—wide-V, double-V, round, double round or special types, accurately machined on bearing surfaces.

Adams Cherry Snap Flask

THE ADAMS COMPA

MOLDING MACHINES · FLASK

Adams Cast Iron Jackets

—assure perfect mold protection

The unique patented construction of the Adams Cast Iron Jacket, combining horizontal and vertical corrugations, provides great strength and rigidity with minimum weight.

Inner surfaces are accurately surface ground, and assembly is made on a fixture to exact size and to assure correct taper in the case of tapered jackets.

Specify Adams Jackets for proper mold protection. For best results, use them in combination with Adams Cherry Slip Flasks or Adams Cherry Snap Flasks.

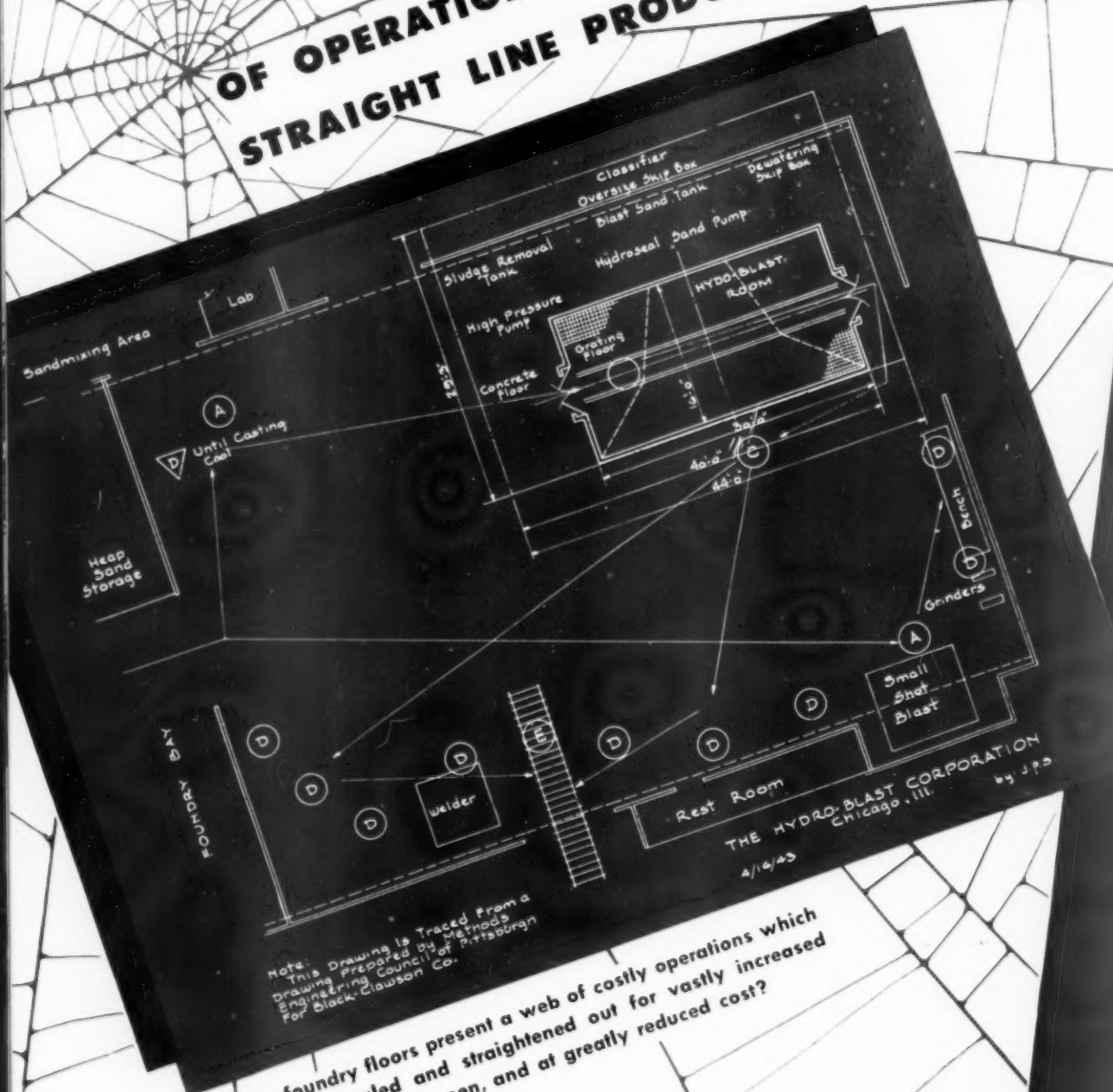
Adams Steel Jacket

NY · DUBUQUE, IOWA · U.S.A.

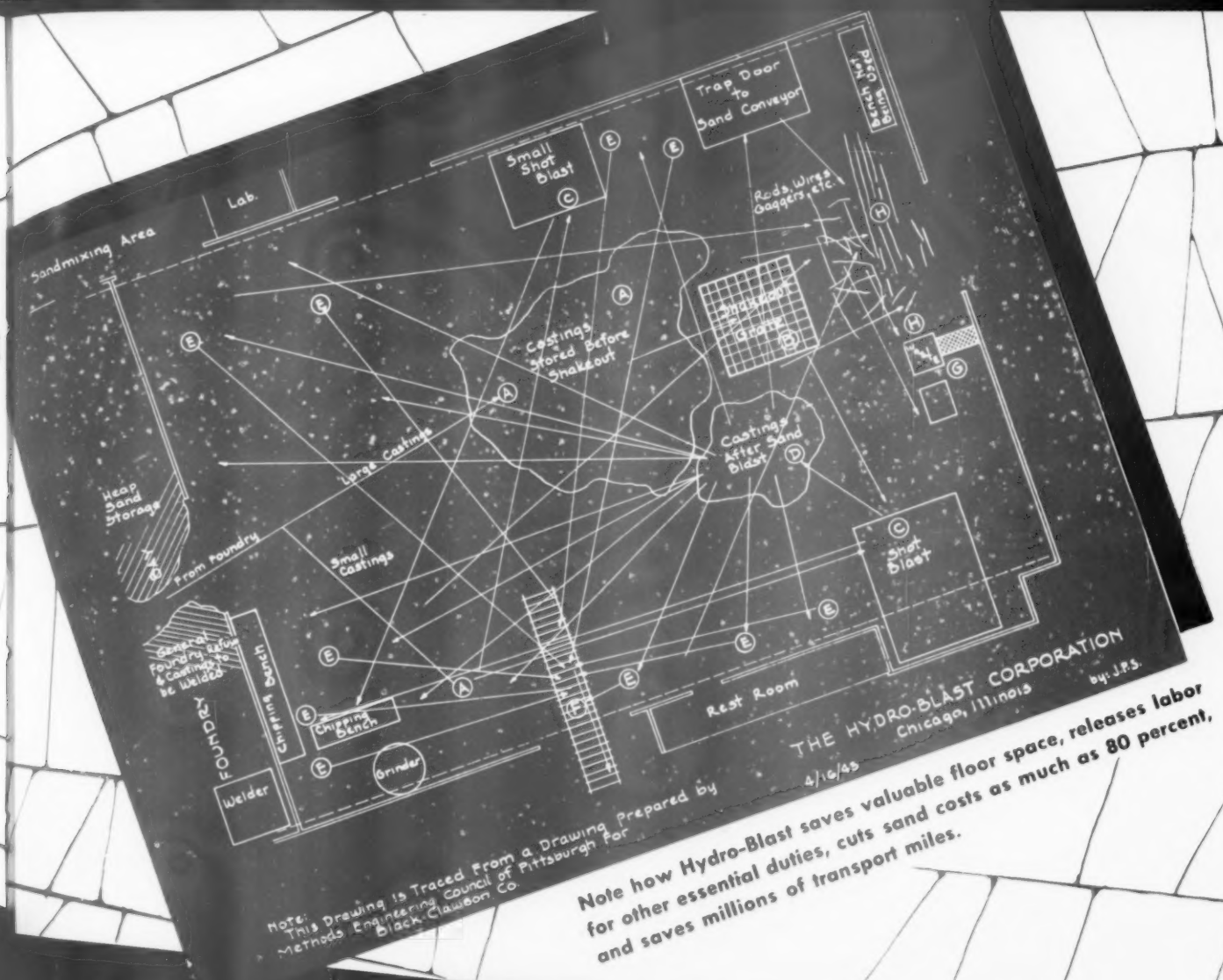
EQUIPMENT Established 1883

a WEB

OF OPERATIONS CLEARED FOR STRAIGHT LINE PRODUCTION BY HYDRO-BLAST



Do your foundry floors present a web of costly operations which could be untangled and straightened out for vastly increased production with fewer men, and at greatly reduced cost?



Note how Hydro-Blast saves valuable floor space, releases labor for other essential duties, cuts sand costs as much as 80 percent, and saves millions of transport miles.

A straight line in the modern foundry is the shortest distance between molding floor, Hydro-Blast room and the finished product.

Today, in more than fifty foundries, Hydro-Blast systems are knocking out cores, cleaning castings microscopically clean, recovering valuable sand in better than new condition, and reducing essential transport ton miles by more than seventy-five percent.

The recovery of valuable core and molding sand for reuse at less than 75 cents per ton, including labor, power, water and maintenance, more than pays for the Hydro-Blast system during the first year of operation and releases many millions of freight ton miles for the transport of sorely needed war materials.

Hydro-Blast engineers at your request will arrange with the War or Navy Departments for visits to Hydro-Blast equipped foundries

THE HYDRO-BLAST CORPORATION

2550 N. Western Ave. Chicago, Ill.

Special Purpose...

IRONTON BERLITE

REFRACTORY BONDING MORTAR FOR FOUNDRIES

"Ironton Berlite" is a valuable refractory cement or bonding mortar for use in laying up the brick in brick lined ladles, for laying cupola blocks in the well and melting zone, for bungs and sidewalls of air furnaces and for laying high alumina and super-duty fireclay brick in electric furnaces.

Its use prevents joint erosion and premature failure. Ordinary fire clay shrinks when used as a mortar in foundry furnaces, but "Ironton Berlite" does not shrink under any service conditions.

"Ironton Berlite" is much more refractory than fire clay, it gives a strong bond in the joints, and is very resistant to molten metal and slag attack.

●

For greater brick life and better furnace efficiency, use "Ironton Berlite".

Address Box 309

THE IRONTON FIRE BRICK COMPANY

RELIABLE REFRACTORIES

IRONTON OHIO

450# CORES BAKED IN 45% LESS TIME WITH DESPATCH OVENS

A CASE HISTORY NO. 1 OF A SERIES

FORCED CONVECTION HEAT quickly bakes these 450-lb. cores in this car-loading type Despatch oven. Gas-fired. Very efficient, economical and space-saving.

SAVING 5 HOURS ON EACH LOAD in baking time, the Despatch core oven shown above offers a typical example of the *superior* performance of these units on the job—a characteristic feature of Despatch ovens for 41 years.

Recently installed in the large foundry of Crown Iron Works in Minneapolis, this oven uniformly bakes heavy, complex cores (weighing almost 500 lbs. each) in 6 hours—although 11 hours were formerly required. Difference in baking-time is due to use of an extra-powerful forced convection heating system of unequalled efficiency, a system developed by Despatch engineers especially for foundry ovens.

In addition to faster baking, a Despatch oven also:

IMPROVES CORE QUALITY by smooth, effective penetration of forced convection heat. Uniform, accurately controlled; no hot spots.

NEEDS LESS FLOOR SPACE as oven is compact with heater and fans mounted on top. All types to fit any shop layout.

IS EASIER TO LOAD with all types of handling systems, including automatic conveyors, cars, racks and others.

BOOSTS CORE PRODUCTION by baking more cores per day, per oven and per man. Fast, high volume heat transfer. No rejects.

USES MINIMUM FUEL as patented "Controlled Combustion" feature gives maximum heat from fuel through operating range.

SAVES LABOR through automatic oven operation. Frees workmen for other jobs. *Even unskilled men can run these ovens.*

PERFORMANCE TESTED For All Foundries

VERTICAL CONVEYOR

ROLLING DRAWER

HORIZONTAL CONVEYOR

RACK LOADED TYPE

FREE! ***WE'LL ANALYZE YOUR FOUNDRY OVEN PROBLEMS*** *without cost and give you* ***practical*** *suggestions based on 41 years experience. Let us help you cut costs in your plant . . . eliminate waste . . . get more out of your equipment . . . and do the job in a more modern,* ***easier*** *way. You'll like our prompt, competent service.*

PHONE, WIRE OR WRITE TODAY!

DESPATCH OVEN COMPANY MINNEAPOLIS

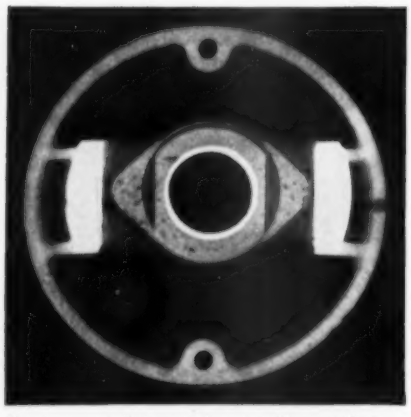
WRITE TODAY for 16-page Bulletin 31

Which is the "Dud"?

X-ray tells *instantly*

LOOKING INSIDE **WITH X-RAY**

ASSURES 100% PERFECT DIE CASTINGS



X-ray reveals porosity in die casting—a typical example of how x-ray inspection helps control quality by detecting subsurface faults.

Critical jobs like bomb and shell fuses needed in huge volumes are a "natural" for the die casting process. It provides advantages held at high premium for war production: (1) high-speed, precision production (2) little or no finishing (3) conservation of critical materials.

Each part, however, must be perfect. Faults undetectable by ordinary inspection may cause premature explosions or other ammunition failures. But with x-ray on the job—faulty castings are detected easily—nondestructively—and without penalizing the high production speeds possible with die casting.

Quality control of die castings is only one of hundreds of production jobs that can be done faster, better and cheaper with x-ray. Others include inspection of welds, packages, assemblies, and countless other jobs.

Learn more about x-ray. Write for our new 38-page book on x-ray inspection . . . it explains x-ray . . . how to set up an x-ray department . . . how to select the right equipment. Ask for B-3159.

Or to discuss your problem with an Industrial X-ray Specialist, call your nearest Westinghouse office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

J-02020

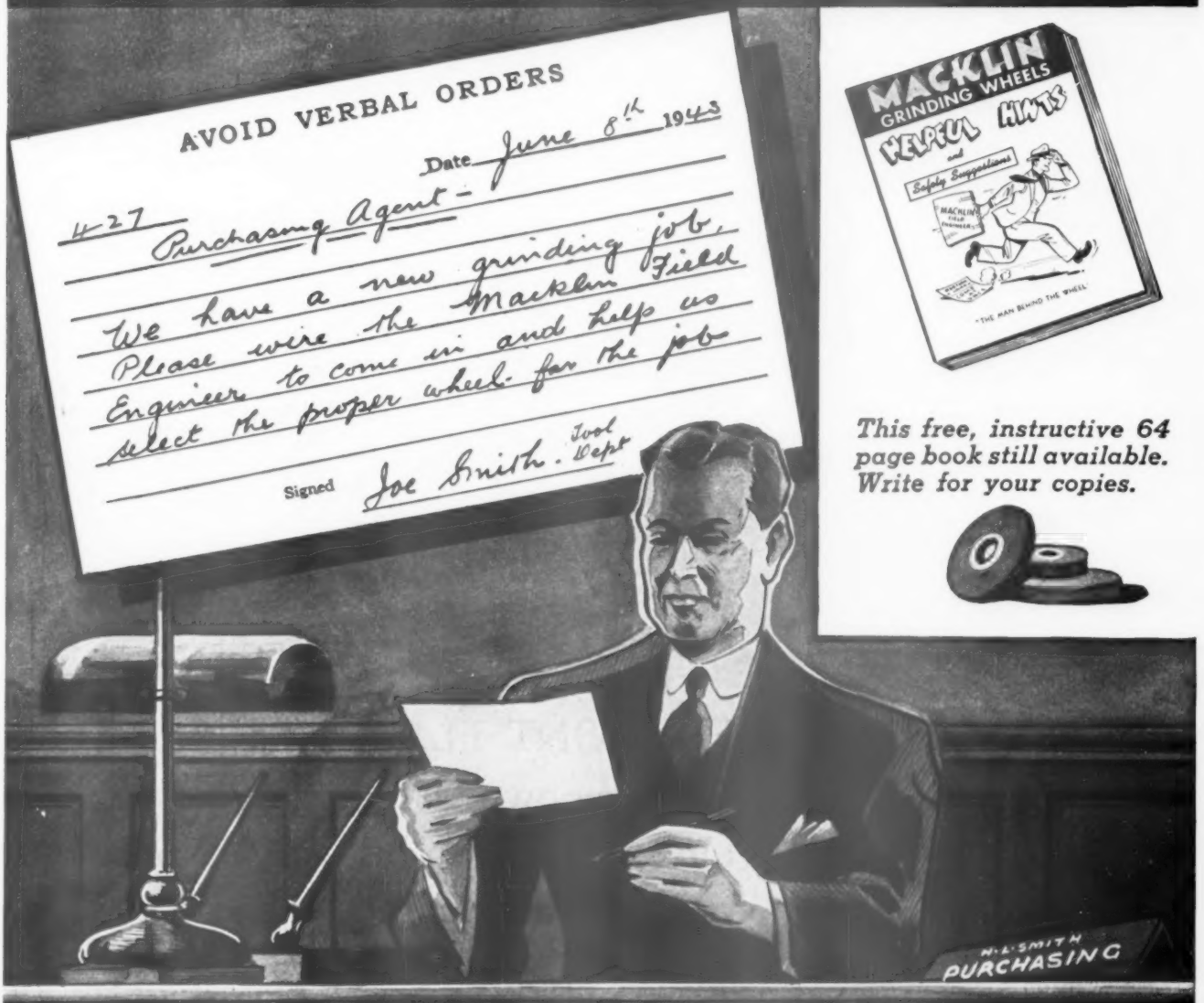
LOOK INSIDE WITH WESTINGHOUSE X-RAY

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

X-RAY

MACKLIN
GRINDING WHEELS


AVOID VERBAL ORDERS
Date June 8th 1943
427
Purchasing Agent -
We have a new grinding job.
Please wire the Macklin Field
Engineer to come in and help us
select the proper wheel for the job
Signed Joe Smith. Tool Dept
H. L. SMITH
PURCHASING

This free, instructive 64 page book still available. Write for your copies.

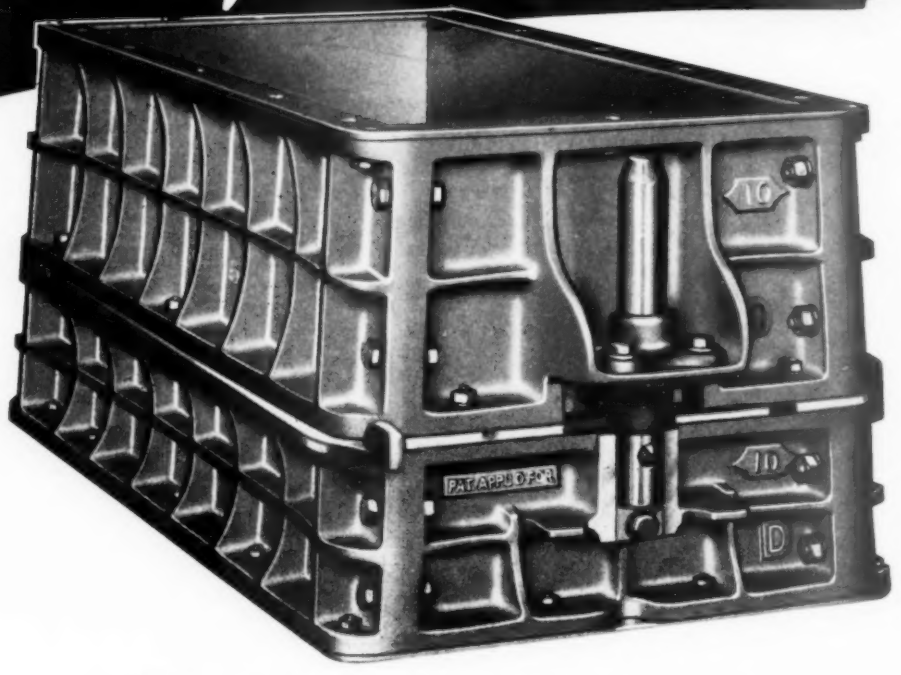
MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

Same Top Quality
Same Light Weight



PROMPT SHIPMENT ASSURED

FREMONT FLASKS have always been renowned for efficiency and long wear. Their sturdy construction retains accuracy and as always, FREMONT FLASKS are light weight to speed production.

THE FREMONT FLASK COMPANY
FREMONT, OHIO

Slip Flasks FREMONT GROOVLOCK Jackets

ARE FERRO-ALLOYS
PART OF YOUR IRON AND
STEEL MAKING PROBLEMS?

FOR SOUND, PRACTICAL
SHIRTSLEEVED ADVICE
GET IN TOUCH WITH

Ohio Ferro-Alloys Corporation
Canton, Ohio

Chicago Detroit Pittsburgh Tacoma

MAKERS OF
Ferro-Silicon 50%
Ferro-Silicon 75%
Ferro-Silicon 85%
Ferro-Silicon 90%
High Carbon
Ferro Chrome
High Carbon
Ferro-Manganese
BOROSIL
SIMANAL
FOR THE STEEL
INDUSTRY

Osborn helps mould eyes that see a pilot home

A PILOT used to be in a pretty tight spot when he couldn't see where he was going. Drilling along through dirty weather, he sometimes found himself flying in circles, or even upside-down, believe it or not.

Now, thanks largely to the inventive genius of the Sperry Gyroscope Company, Inc., he doesn't need to rely upon guesswork, his eyes, nor flying instinct. When the going gets too tough he can turn the job over to his automatic pilot.

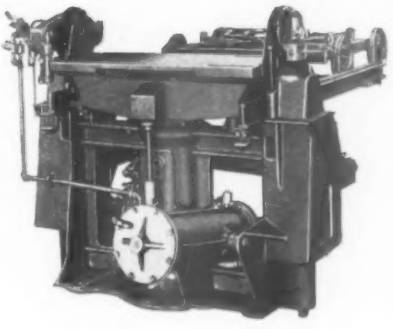
This marvel of science and precision workmanship automatically keeps the airplane on a straight and level course, come fog, clouds, or the blackest night. In such a mechanism each part must be accurate and true in every detail.

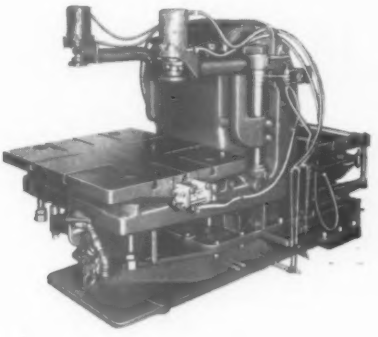
That applies to castings too . . . which is why the precise, close-tolerance castings in the famous Sperry Gyropilot are moulded on Osborn Moulding Machines.

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue *Cleveland, Ohio*

OSBORN





HERE are just two of several types of Osborn Moulding Machines, batteries of which are mass-producing moulds for vital castings of the Sperry Gyropilot.

This is aircraft work of the most precise kind. It calls for smooth, accurate operation and flexibility of control at all times. It also calls for high-volume production to meet the demands of our vast aircraft program.

Precision and Production—The Jolt, Rollover, Pattern-draw and Jolt, Rockover, Pattern-draw machines shown above are among the several types of Osborn Moulding Machines fulfilling the stiff requirements of big-scale mould production for Sperry Gyroscope Company, Inc.

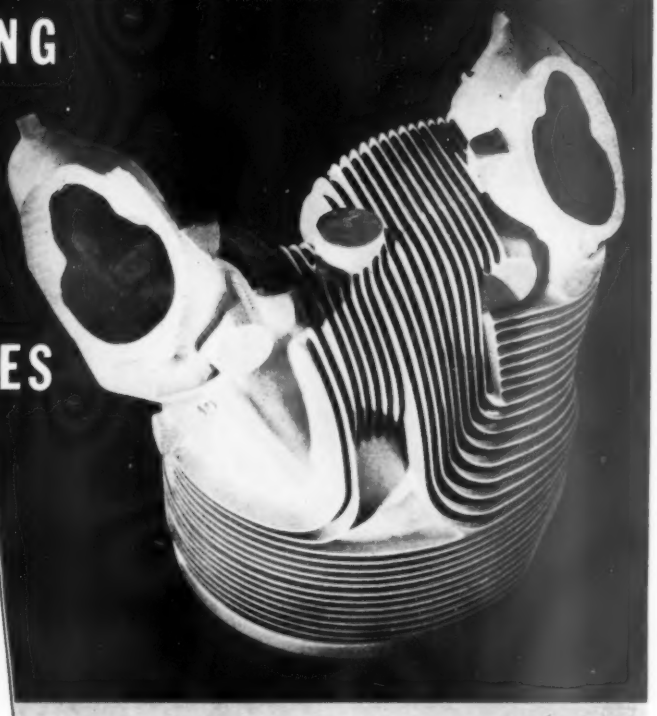
THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue *Cleveland, Ohio*

OSBORN

MOULDING MACHINES

ANOTHER OUTSTANDING DEVELOPMENT OF DELTA RESEARCH LABORATORIES



MEMO

Re: *Delta Grakoat A-1*

for Aluminum

This is one of the castings made with the new Delta Grakoat A-1 Core Wash.

A very decided improvement!

POROSITY ELIMINATED

•

SCRAP LOSS REDUCED

•

CLEANING ROOM COSTS SUBSTANTIALLY CUT

•

DELTA Grakoat A-1 is a chemically active core wash specially developed for a specific application. Its particular and unusual function is the elimination of oxide formation by chemical action when the metal is poured . . . a function entirely unique and original in core wash development.

DELTA CORE WASHES, for Steel, Grey Iron, Malleable and Non-Ferrous castings, are ALL products of scientific research. Each has been specially developed for the particular application for which it is recommended . . . to produce sound, clean, finely finished castings.

Laboratory controlled uniformity makes DELTA Core Washes thoroughly dependable and the popular preference of leaders in the foundry industry all over the north American continent.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF

INDUSTRIAL AND AUTOMOTIVE OILS, GREASES AND COMPOUNDS

MILWAUKEE 9, WISCONSIN

Juniata

The UNIVERSAL FOUNDRY SAND

for Cores, Molding and Facing Sand

	JUNIATA (P.M.R.R.)	WATROUSVILLE (M.C.R.R.)	WILMOT (D.C.& S.R.R.)	MILLINGTON (Dried only)	HEMLOCK (Dried only)
A.F.A. Fineness	90	141	62	106	63
Grain Distribution Avg.	96	97	117	74	117
A.F.A. Clay Content Avg.	.7%	2.15%	.8%	.95%	.8%
Base Permeability	45	22	105	38	95
PERMEABILITY at 3.5% Moisture	68	34	160	65	150

JUNIATA CHEMICAL ANALYSIS

Silica	92.09%	Magnesium Oxide	.22%
Iron & Aluminum Oxide	6.09%	Loss on Ignition	1.02%
Calcium Oxide	.58%	Fusion Temperature	3100 deg. F.

LAKE CICOTT
(INDIANA)

We also own and operate large foundry bank sand deposits in cen'ral Indiana.

SPECIFICATIONS:

A.F.A. Fineness	75
Grain Distribution	88
A.F.A. Clay under	3%
Base Permeability	70
Permeability at	3.5%
Moisture	90

IDEAL summer mining and loading conditions make possible the filling of large orders both artificially dried and bank run sands now.

Avoid possible delays occasioned by bad weather and car shortages next fall and winter by "stock piling" your winter requirements at an early date.

Production and drying facilities have been increased to meet winter foundry needs.

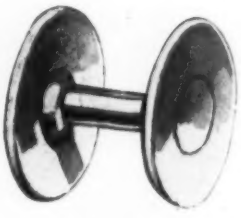
SAVE CEREAL BINDERS—*JUNIATA bank sands will replace cereal binder entirely or in part, to give cores necessary green strength.*

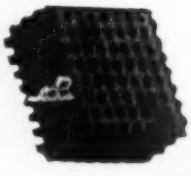
Great Lakes Foundry Sand Co.

UNITED ARTISTS BLDG. DETROIT, MICHIGAN

MINERS — PROCESSORS — FOUNDRY, METALLURGICAL AND SAND BLAST SERVICE

KEEP 'EM FIRING!





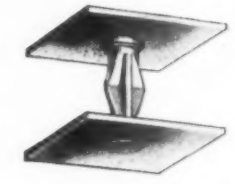
THE hardest job is still ahead—it may be a long one or a short one—but it's the final push to Victory. From now till then, every production minute should be turned into the utmost efficiency.

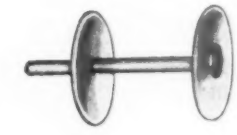
If you're not using Fanner Chaplets—why not investigate them now. Every precious second they can step up your production schedule—every "throw-out" they can eliminate from your production line—every single bit of extra strength and service they can add to your product—all help bring Victory sooner.

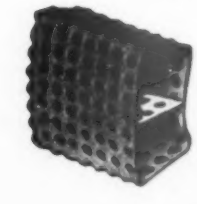
Our engineers are at your service without obligation.

Ask for the Fanner catalog—
if you haven't a copy on hand.

The
FANNER MANUFACTURING COMPANY
Brookside Park **Cleveland, Ohio**





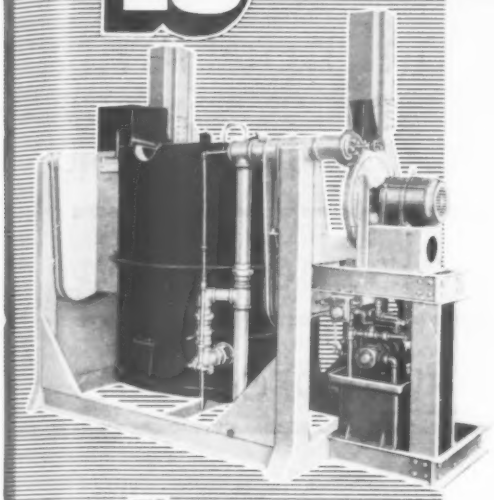


FANNER CHAPLETS

STROMAN

The Last Word in Melting Furnaces

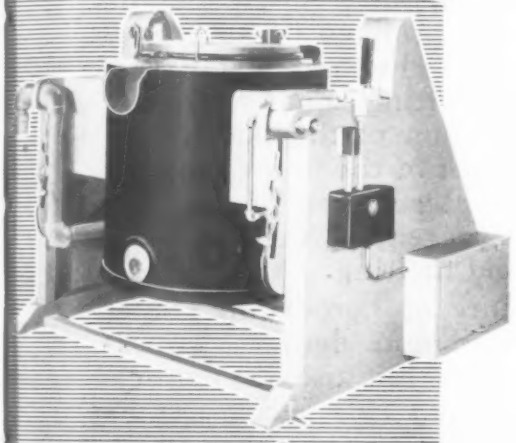
FOR BRASS, BRONZE, ALUMINUM, MAGNESIUM AND ALL OTHER NON-FERROUS METALS



HYDRAULIC TILTING FURNACES

FOR ALUMINUM AND MAGNESIUM
Capacities: Aluminum 500 to 3000 lbs. — Magnesium 350 to 2000 lbs.

These furnaces combine every known furnace innovation, to assure fastest, safest and most economical production. Hydraulic Tilt is the safest, smoothest, easiest to operate and greatest metal saving manner of pouring . . . Stationary Lip Pour, another feature, allows ladle to remain in the same position during entire pour . . . Variable Speed Pour controls tilting speed as desired by operator . . . Streamline Design conserves floor space . . . Heavy Duty Construction assures longest life. They can be fired by either oil or gas.



CRUCIBLE FURNACES . . . MECHANICAL TILTING

FOR BRASS AND ALUMINUM
Capacities: 450 to 1200 lbs. — Aluminum 150 to 400 lbs.

The most advanced furnace of its type. Stationary Lip Pour holds metal spillage to a minimum and speeds production . . . Electric Tilt is finger-tip controlled . . . New Push-Back Cover is easiest and safest to operate . . . Oil or gas fired in conjunction with Stroman Blowers they are most economical in fuel costs . . . Safety features are many and exclusive with Stroman Furnaces.

MANUAL TILTING FURNACES

FOR BRASS, BRONZE AND ALUMINUM
Capacities: from No. 40 to 400 Crucible

The "Old Standby's" with the rugged construction that has proved that these furnaces can "take it" in many of the leading foundries the country over. Redesigned to eliminate old style massiveness without sacrificing strength or rigidity anywhere, this is a more popular furnace than ever. Tilt mechanism is hand wheel, easy to operate, swing cover is extremely easy to open and close. Oil or gas fired as desired. All sizes from 40 to 400 CRUCIBLES.

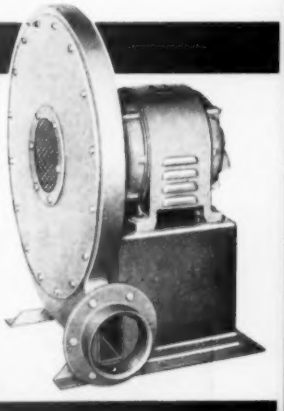
CRUCIBLE STATIONARY FURNACES

FOR BRASS, BRONZE, ALUMINUM AND OTHER NON-FERROUS METALS
Capacities: from No. 20 to 400 Crucible

Sturdy, efficient, time saving, these Stroman Furnaces are also most economical in their daily production. Choice is given of three types of covers. The Push-Back which is an exclusive Stroman development and is a great time and labor saving feature . . . is most popular. They are also available with Swing type or Counter-Balanced covers. Oil or Gas fire.

STROMAN CENTRIFUGAL BLOWERS

Combine every feature to make a great blower . . . Uniform Pressure . . . Simplicity of Design . . . Welded Steel Fabrication . . . Permanent Alignment . . . Quiet Operation . . . Compactness. All in all they have many uses in the foundry field and assure you of getting the correct amount of air where you want it when you want it.

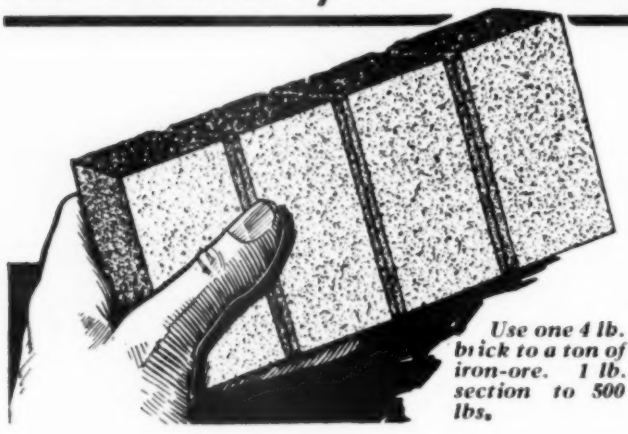


WRITE NOW FOR FULL INFORMATION OF FURNACES AND BLOWERS

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF
THE PETERSEN OVEN CO. 300 W. ADAMS ST. CHICAGO

On the toss of a coin, many unimportant decisions are made. The toss of a brick of Famous Cornell Flux into the cupola, however, solves many of the foundryman's vital problems



Use one 4 lb. brick to a ton of iron-ore. 1 lb. section to 500 lbs.

FAMOUS CORNELL FLUXES

Trademark Registered

EFFICIENT

ECONOMICAL

DEPENDABLE

CONVENIENT

The use of Famous Cornell Cupola Flux solves the problem of excessive cupola lining wear by its constant reglazing of the melting zone walls. By speeding up the flow of the slag it prevents bridging over of the under tuyeres, keeping up the steady flow of hot iron and thus also preventing excessive oxidation from cold melting.

The problem of producing finer grained, tougher and denser castings will be solved by the use of Famous Cornell Iron Cupola Flux because of its high refining qualities.

Supplied in its convenient charging form of four-briquette-bricks it eliminates fluxing guesswork—a briquette to each 500 pound charge of iron—a brick to the ton.

Consistent use of Famous Cornell Cupola Flux reduces limestone requirements considerably in most instances. Because it also eliminates the necessity of frequent cupola repairs it is more economical to use than fluorspar and other soda ash compounds. Use it consistently for thirty days and convince yourself completely of the truth of these statements.

SERVING AMERICA'S FOUNDRIES THRU TWO WORLD WARS

The CLEVELAND FLUX Co.

1026-34 Main St., N.W., Cleveland, Ohio

TANKS—PLANES—SHIPS and GUNS

Rollover No. 34 Model SA

Rollover No. 34 Model A

Steel, Malleable and Gray Iron Castings, also Magnesium and other Non-Ferrous metals are vital parts of the Allied war machines which are being produced at unprecedented speed in the foundries of America using Davenport molding machine equipment.

First—let's win this war—with every known efficient foundry practice.

Then, after the war, let's have the foundries of America equipped to meet the competitive world market.

"DAVENPORT" LINE OF MOLDING MACHINES

JOLT ROLLOVER DRAW MACHINE

Model SA (Seven sizes)—Capacity from 750 to 12,000 lbs.
Model A (Six sizes)—Capacity from 1,000 to 12,000 lbs.

JOLT PIN-LIFT OR PUSH-OFF MACHINES

(With Adjustable Lift Pins)
Six sizes—Capacity from 1,000 to 10,000 lbs.

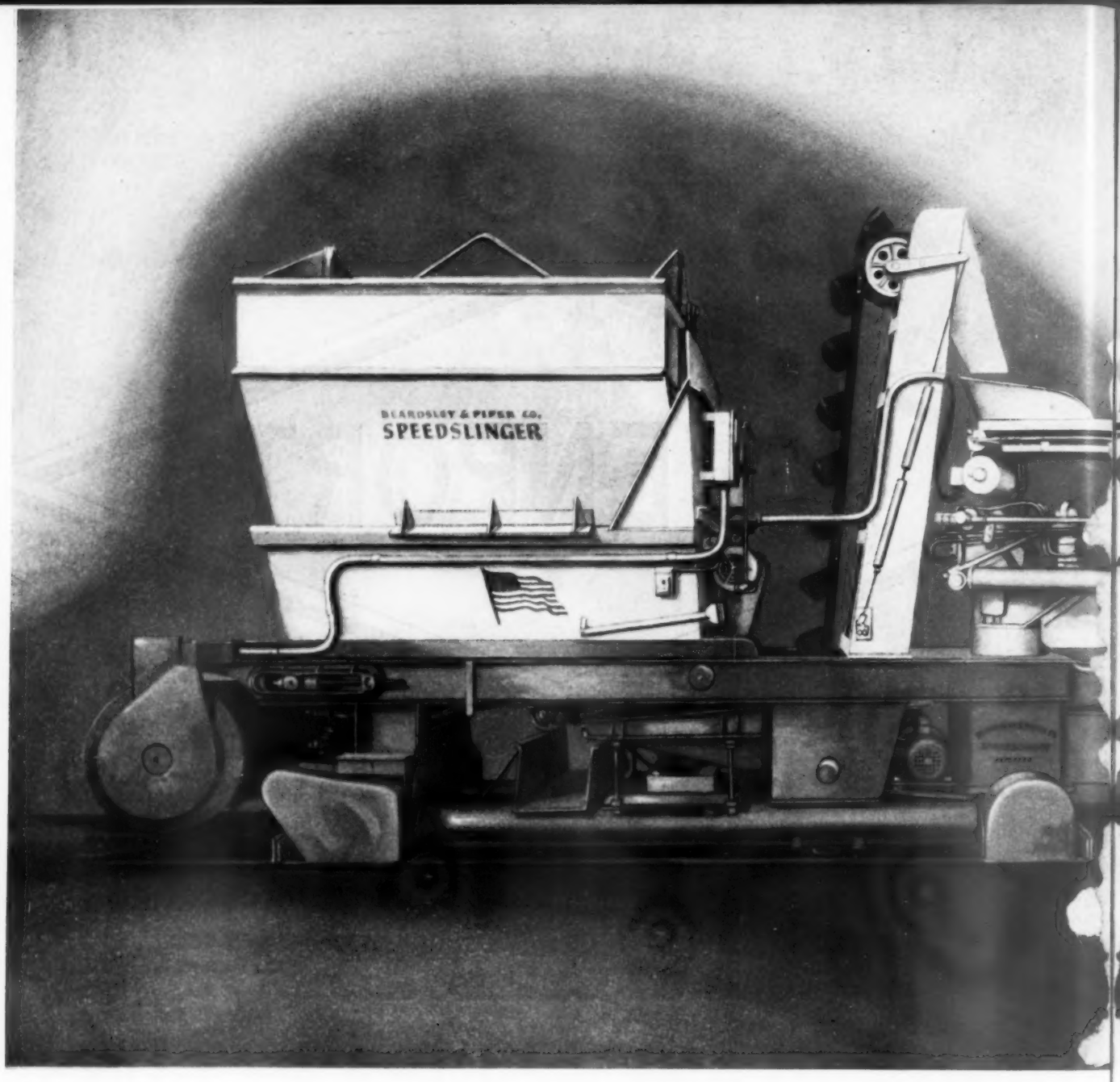
PLAIN JOLT MACHINES

Fourteen sizes—Capacity from 200 to 25,000 lbs.

Send for our Catalog. Choose modern equipment. Although deliveries are slow, place your order today. Be prepared for peace.

DAVENPORT MACHINE & FOUNDRY CO.

DAVENPORT **IOWA, U. S. A.**



The Motive Type

RAMS 1,000,000 POUNDS

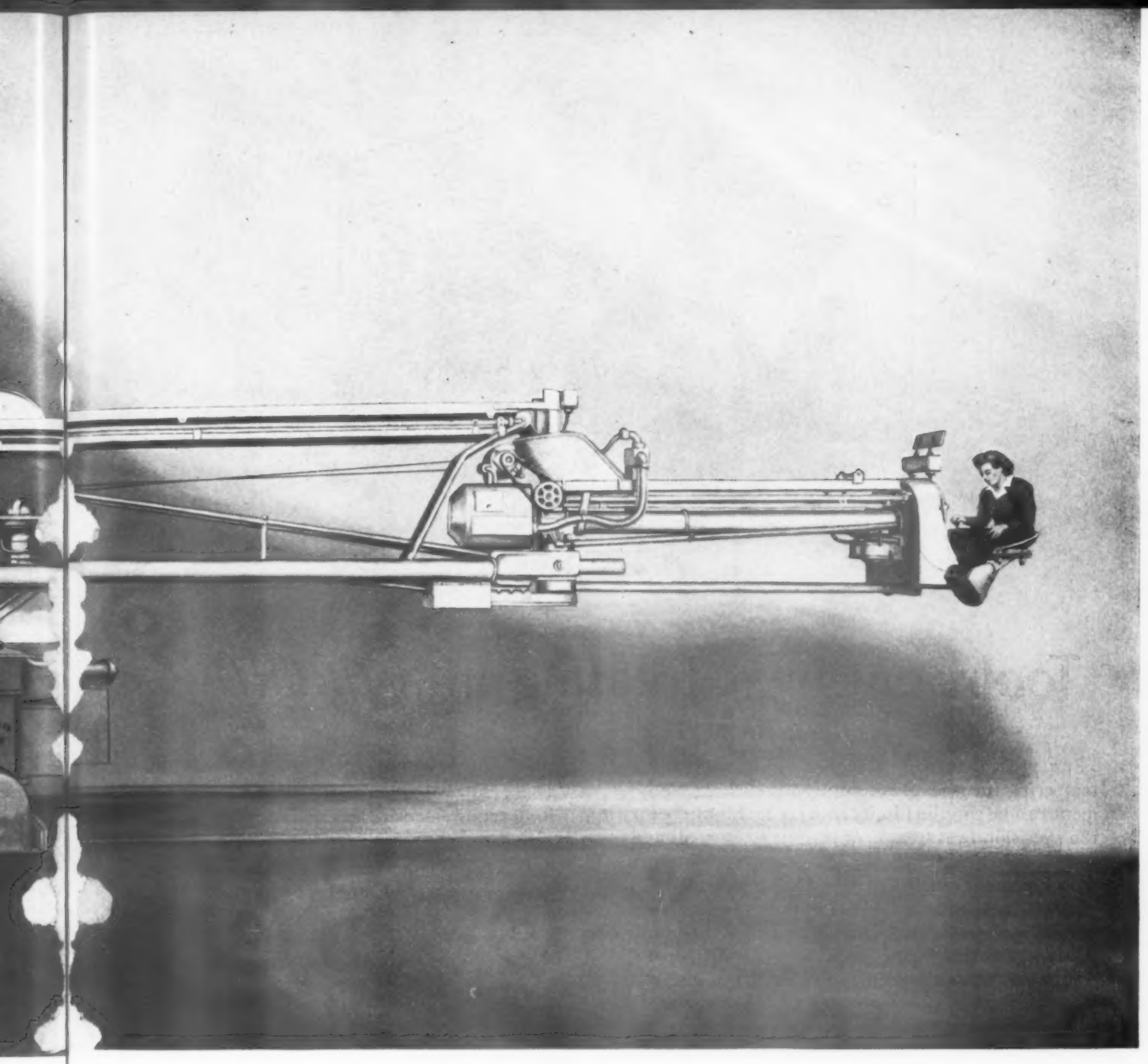
In steel jobbing foundries, a molder and his helper will ram a maximum of 1 cubic foot of sand in 2 minutes at a total cost of 10 cents. The *Speedslinger* and operator, man or woman, will ram 20 cubic feet of sand per minute at a total cost of 3 tenths of one cent per cubic foot.

Compare your ramming cost with the Speedslinger cost of $30.00 per day, including operation, maintenance and depreciation. You need only ram 375 cubic feet with the *Speedslinger*, which is done in the first 19 minutes of ramming, to save in labor the cost of the *Speedslinger* and operator for one day. It costs as much to ram 375 cubic feet with skilled labor as it costs to ram 10,000 cubic feet with the *Speedslinger*.

The Speedslinger performs the ramming labor of 50 skilled men while doing a superior ramming job. It has been determined in steel jobbing foundries that the average labor cost of filling a flask and ramming it pneumatically is 10 cents per cubic foot, as opposed to 3 tenths of one cent per cubic foot when filled and rammed by the *Speedslinger*.

Compare hand ramming labor cost versus *Speedslinger* ramming cost on the production of tank hulls by one Speedslinger user. When this steel jobbing foundry was commissioned to make tank hulls, they were not equipped with the *Speedslinger* and their production was one tank hull in 8 hours from one pattern. Today, with the Speedslinger, they have stepped up their production of tank hulls to 7 molds in 6 hours from one pattern and the same floor space. Since this flask requires 1073 cubic feet of sand, and the hand ramming cost was 8 cents per cubic foot in this production shop, these figures speak for themselves.

THE BEARDSLEY & PIPER



SPEEDSLINGER

OF SAND FOR $30.00

Hand Ramming 7 Tank Hull Molds Costs $600.88

Number of cubic feet per mold	1073
Hand filling and ramming cost per cubic foot (labor)	.08
Hand filling and ramming cost per mold (labor)	$ 85.84
Hand filling and ramming cost on 7 molds (labor)	$600.88

Speedslinger Ramming 7 Tank Hull Mold Costs $22.54

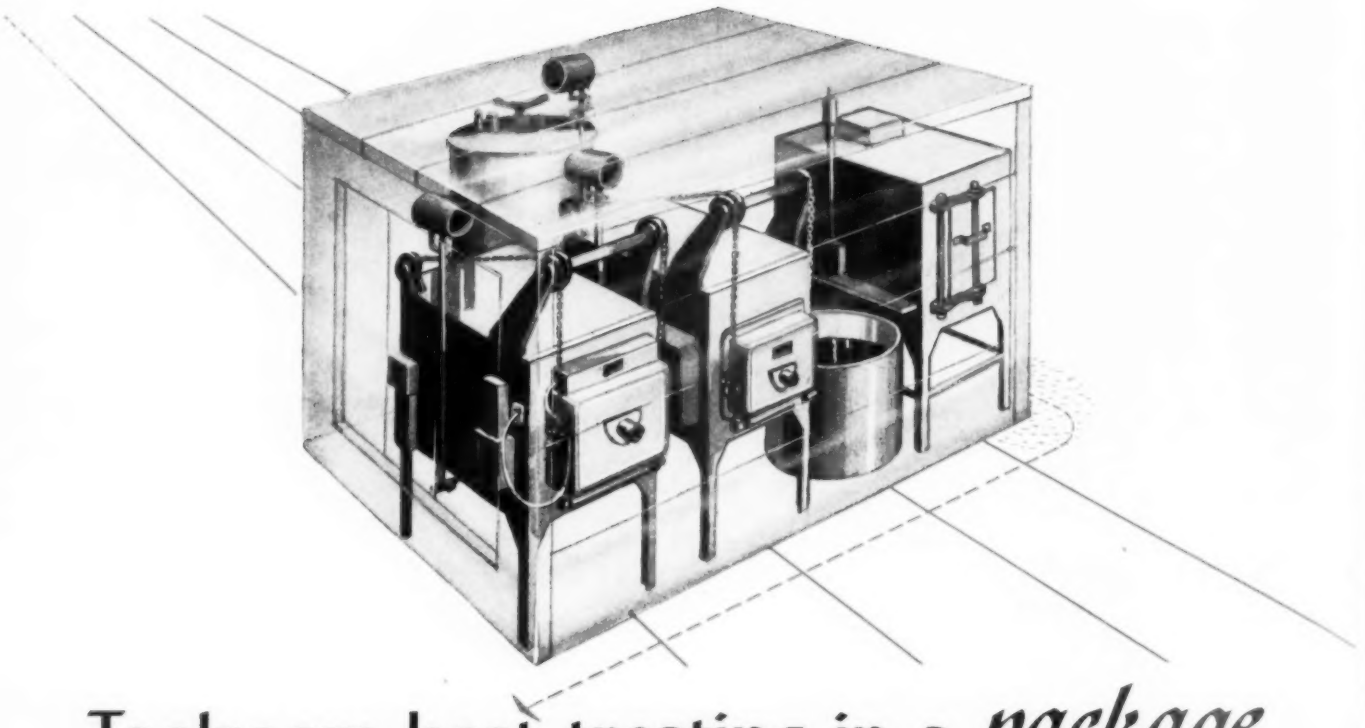
Compare the labor cost alone of hand filling and ramming with the *Speedslinger* filling and ramming cost of 3 tenths of one cent per cubic foot, including operator's wages. The actual savings in labor alone are astonishing, we might even say miraculous.

Hand filling and ramming cost on 7 tank hulls at 8 cents per cubic foot	$600.88
Speedslinger filling and ramming cost on 7 tank hulls at 3 tenths of one cent per cubic foot	22.54
Speedslinger labor saving	$578.34
Speedslinger Labor Savings on 7 Tank Hull Molds	$578.34

The labor saving of $578.34 on those 7 tank hulls is a formidable figure for 6 hours of *Speedslinger* operation. But today, when the manpower shortage is most acute, the release of fifty skilled foundrymen for other less fatiguing duties is an even greater accomplishment performed by this modern machine.

May we suggest that you consult with *Speedslinger* users who are ready and willing to demonstrate the efficiencies and economies of the *Speedslinger* method of ramming large and small castings.

COMPANY 2541 NORTH KEELER AVENUE • CHICAGO, ILL.



Toolroom heat treating in a *package*

. . . a preheat furnace, a high speed furnace and a tempering furnace, plus complete quenching equipment can be supplied in its entirety by Lindberg for the precision heat treatment of your finest tools and dies.

1. The preheat and high speed hardening furnaces employ the Lindberg Hydryzing process for hardening *all* tool steels. Hydryzing is economical because it saves you the expense of costly cleaning operations such as sandblasting, polishing, stoning, etc. Its neutral atmosphere protects all tool steels from scale, decarb and carburization with the consequent assurance of long productive tool life.

2. The famous Lindberg principle of tempering solely with recirculated air, plus the precision and uniformity of heating are a few of the reasons why the Lindberg Cyclone Tempering Furnace is the most widely used tempering unit in the field today. The result of the Cyclone's close heating control and uniformity is perfect tempering to specifications with the desired toughness for maximum tool life.

3. With full toolroom setups, Lindberg can supply pot furnaces and complete equipment to meet any quenching requirements.

Learn how you can have all the advantages of clean, full hardening and accurate, low-cost tempering. Write TODAY for Bulletins 94 and 62.

A typical tool for Hydryzing is this bell shaped cutter, which is made of Moly High Speed Steel. It is 2 17/32" long through the bore, has a 5" outside diameter and weighs 8¼ lbs.

It was preheated in a Hydryzing Furnace at 1500°F., for 48 minutes, then placed in the high speed furnace for 12 minutes at 2225°F. It was quenched from 2225°F., into an 800°F., lead bath to avoid cracking at the sharp recesses of the teeth. From the lead bath it was allowed to cool to 150°—180°F.

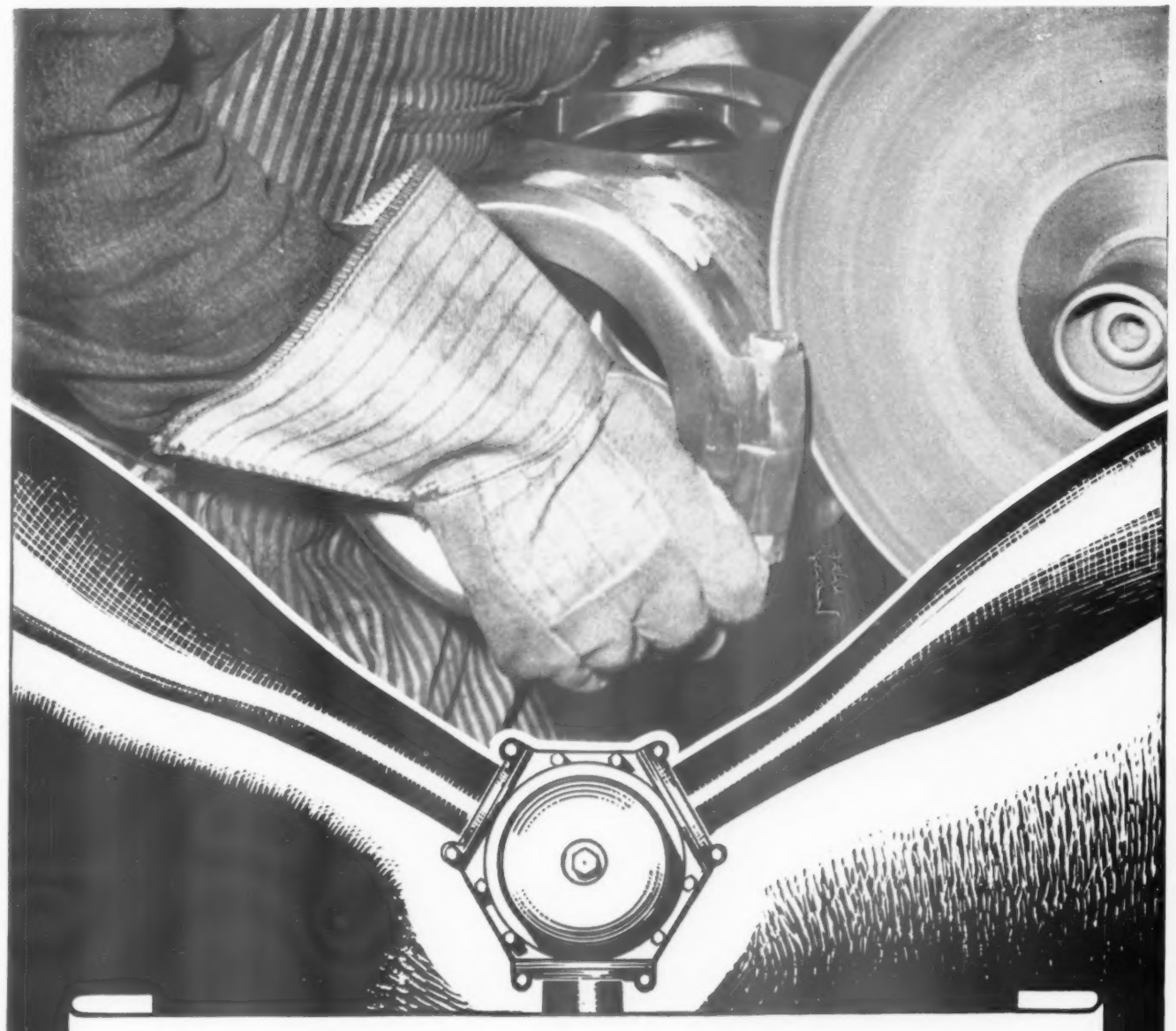
In a Cyclone Toolroom Tempering Furnace, the cutter was heated for 2 hours at 1025°F., removed and allowed to cool to room temperature. Hardness was 65-67 Rockwell "C".

LINDBERG FURNACES

LINDBERG ENGINEERING COMPANY
2453 West Hubbard Street • Chicago, 12

ARMY E NAVY

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening



Quality Polishing at Aircraft Speeds

Calls for ALUNDUM ABRASIVE

Speed is the watchword in everything connected with aircraft production today. That's why Hamilton Standard Propellers at East Hartford uses Alundum Abrasive for polishing this barrel and many other parts.

Special Norton crushing and screening processes control the grain size and shape of Alundum Abrasive, giving sharp, strong grains that cut fast. Special surface treatments give the grains extra capillarity—the ability to stay in the wheel head until all their work is done.

NORTON COMPANY, WORCESTER, MASS.

NORTON ABRASIVES

G-151

YOU'LL ALWAYS HIT THE MARK

IF YOU USE "PENNSYLVANIA" PRODUCTS IN THAT EMERGENCY

NEED THESE?

LARGEST STOCK IN THE EAST

- SEA COAL FACING
- BINDERS
- PITCH CORE COMPOUND
- LIQUID PARTING
- NON-SILICA PARTING
- TRIPOLI PARTING
- PARTEX—(Walnut Shell Parting)
- BENTONITE
- PENCO CEREAL BINDER
- STEEL SHOT—All Sizes
- STEEL GRIT—All Sizes
- LADLE BOWLS, SHANKS
- KORITE CORE PASTE
- SHOVELS, RIDDLES
- CHAPLETS—All Styles
- SKIM GATES, BRUSHES
- PURITE
- PATTERN SHOP SUPPLIES
- SILVER LEAD FACING
- CORE BLACKING
- PLASTIC IRON
- CORE WIRE, NAILS
- NO-VEIN COMPOUND
- DELTA CORE WASHES
- FOUNDRY SANDS
- SILICA FLOUR
- MISCELLANEOUS SUPPLIES
- MACHINERY & EQUIPMENT

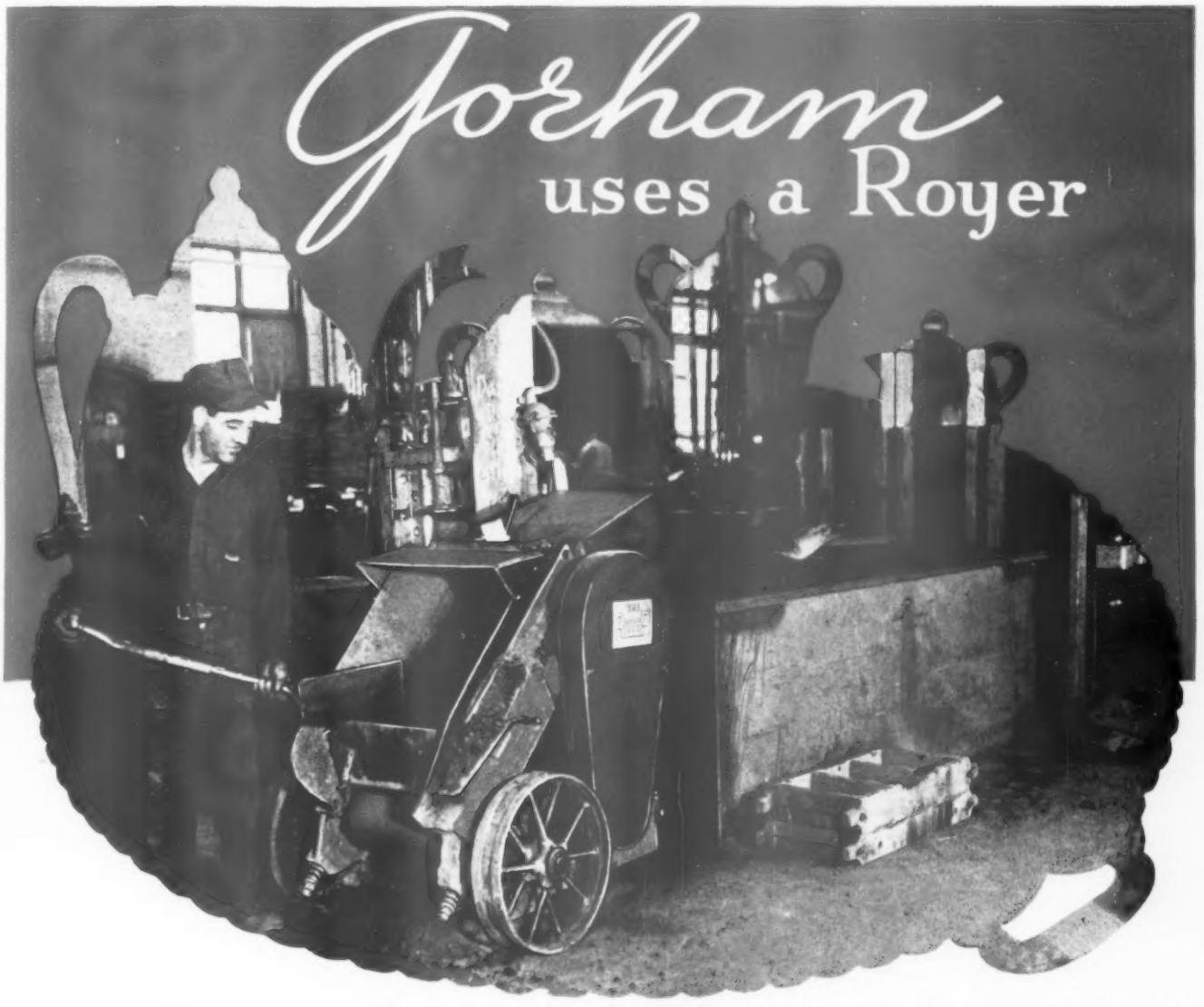
–Distributors for–

ONE PIECE Chaplets.
DELTA Core & Mold Washes, Partex Parting, Core Oils, No-Vein.
LACLEDE-CHRISTY Refractories.
SCHUNDLER Bentonite.
BUCKEYE Firestone.
B. S. & B. Steel Flasks.
REPUBLIC Book Type Core Machines.
BEARDSLEY & PIPER Equipment.
INDUSTRIAL Ladles, Shanks, Tongs.
NEW HAVEN Vibrators.
DEMMLER Core Blowers.
CERES Cereal Binder.
WADSWORTH and AMERICAN Core Machines.
DIAMOND—ADAMS—ARCADE Flasks.
FOSECO Products.
MATHIESON Alkali—Purite.

When we say: FOUNDRY SUPPLIES, we mean EVERYTHING!

PENNSYLVANIA FOUNDRY SUPPLY & SAND Co.
ASHLAND and E. LEWIS STREETS PHILADELPHIA, PA. TELEPHONE, JEFFERSON 1012

Gorham uses a Royer



NOTICE—Royer equipment is sold only by experienced factory-trained engineers who are qualified to advise you on the type of unit best suited to your conditions, and for maximum production. Our representatives have sold Royers for years, and each has satisfactorily serviced hundreds of foundries.

The Gorham Mfg. Co., famed gold and silversmiths, are currently engaged in the making of copper-base castings for essential ordnance parts. Their Model "ND-P" Royer Sand Conditioner provides thorough sand preparation for thin section, smooth surface castings, molded in Albany and Yankee (Cape Cod) sand.

The exclusive Royer "6 point" sand preparation values; (1) thorough refuse removal; (2) positive lump breaking; (3) complete blending and mixing; (4) even distribution of moisture; (5) increased permeability; and (6) double aeration — once on the belt and once at the discharge — effect the same sand preparation economies in foundries of every type, using natural or synthetic sand.

Thousands of foundries making essential ordnance castings — grey iron, malleable, steel and nonferrous — prefer Royers (over 5,000 are in use today).

Look for production economies in your sand heap — Royers will help you minimize discount and increase profits.

THE ROYER

ROYER FOUNDRY & MACHINE CO. KINGSTON, PA.

Increase Production with
ROTOPLANE Speed Sifters

"Hard-to-Please" Foundries Standardize on Rotoplane!

ORDER FROM YOUR FOUNDRY SUPPLY HOUSE

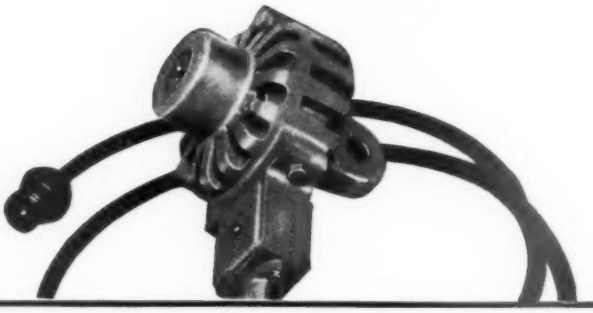
Try ROTOPLANE in your plant. You, too, will find it increases production, does *all* your sifting more quickly and economically. One size and type for all sifting jobs.

ROTOPLANE is built for long, dependable service. Strong, one-piece frame gives remarkably effective vibration. Smooth, free, rotary action. All mechanism completely enclosed and dustproof. Weight approx. 90 lbs., 62 in. high overall.

Steel-mounted sieves instantly interchangeable. No jagged screen edges, no storage problem. 20 in. diameter clear sifting area.

TEN DAYS FREE TRIAL.

$175.00 f.o.b. Chicago—complete with cable, safety ground wire, one sieve (2-4 mesh). Standard ⅓ h.p. motor, 115-230 volts 60 cycle single phase.
Prices with other motors quoted on request.



ELECTRIC VIBRATORS

True-to-pattern castings make satisfied customers . . . more repeat business. Increase your production and castings quality with RED Electric Vibrators. Sturdy, dustproof, lowest operating cost (electricity does not freeze). Unequaled for consistent year-'round results in foundries all over the world.

(All Prices f.o.b. Chicago)

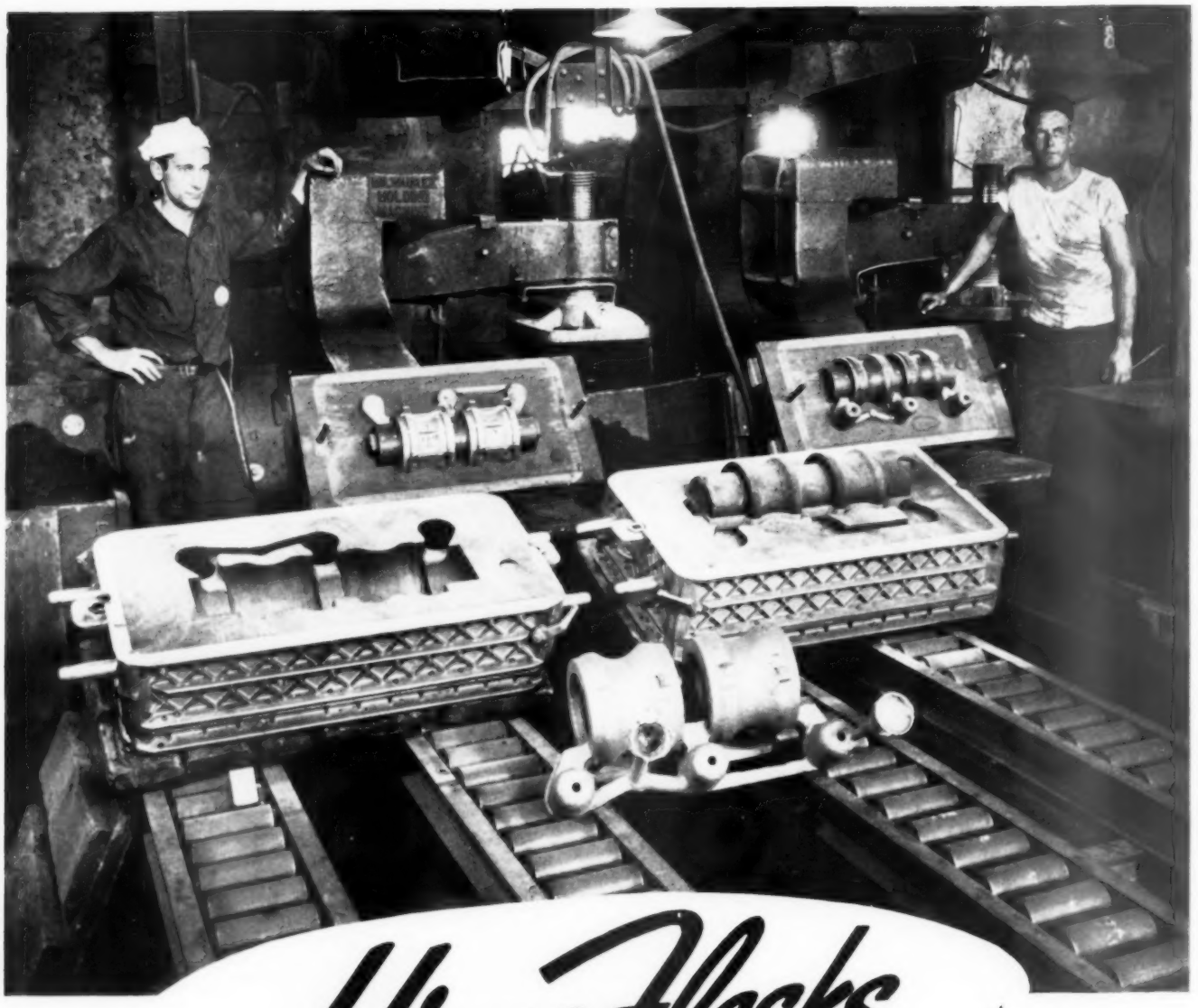
No. 1—Light match plate work..... $10.00	No. 5—Heavy match plate, tub, bench $17.00
No. 2—Medium match plate 13.00	No. 9—Machine and heavier 24.00

FOUNDRY SUPPLIES MANUFACTURING CO.

2221 Orchard Street Chicago, Illinois

CABLE ADDRESS: "ROTOPLANE CHICAGO"

Acme for Action
ARMY
E
NAVY
Quick action on attack brings many glorious victories to our gallant navy. And quick action on the production front in supplying needed equipment spurs the confidence of our boys for those further victories that will drive the enemy from sea, land and air.
Action here at Acme means we are breaking all previous records in producing tools, tool engineering, patterns and heat-treated aluminum castings, to help war production plants deliver essential equipment on time.
Our service is complete -- including engineering service of long experience. Don't hesitate to call on Acme to keep your bottlenecks down -- to step your production up.
ACME PATTERN & TOOL COMPANY, Inc., DAYTON, OHIO
Heat-Treated Aluminum Castings—Patterns—Tools—Tool Designing—Production Processing
For VICTORY buy WAR BONDS and STAMPS



Hines Flasks at Work!

Here is another Hines Flask doing its bit in one of the largest foundries in the country, devoted exclusively to War Work.

Size of flask 16 x 32 $\frac{8}{8}$

MAKERS OF FOUNDRY FLASKS AND JACKETS Since 1919

HINES FLASK COMPANY

Phone ACademy 1480

1324 HIRD AVENUE • CLEVELAND, OHIO

"Shake-out" dust nuisance eliminated by C. O. Bartlett & Snow Company hoods (U.S. Patent Design 121704) equipped with DeBothezat Bifurcators.

Removing heat and fumes from melting furnace. Note simplicity of installation.

Heat and fumes are removed from individually ventilated, crucible melting furnaces.

This VENTILATING UNIT installs in the duct

Any position from horizontal to vertical

YOU CAN INSTALL DeBothezat Bifurcators in any position from horizontal to vertical . . . and *right in the duct!* This feature *eliminates* elbows, bends and supporting platforms. Bifurcators are supported like any length of ordinary duct work. Extreme flexibility makes installation simple and inexpensive.

MOTOR IS ISOLATED FROM FUMES in a through-ventilated chamber. Motor is easily accessible for inspecting and servicing.

MOTOR IS PROTECTED against burning out by non-overloading power characteristic of the DeBothezat Axial-Flow fan.

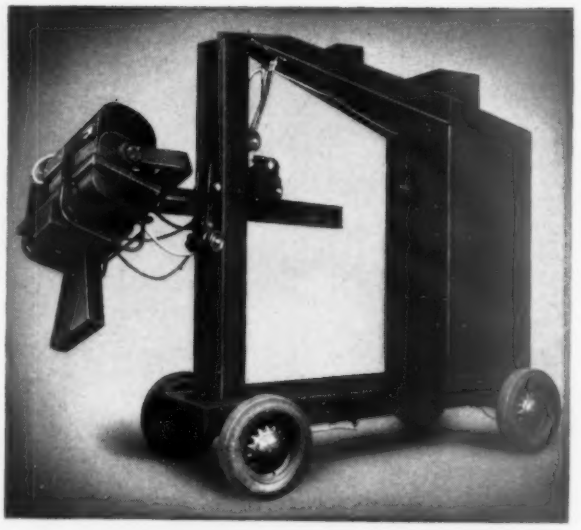
ARMY E NAVY

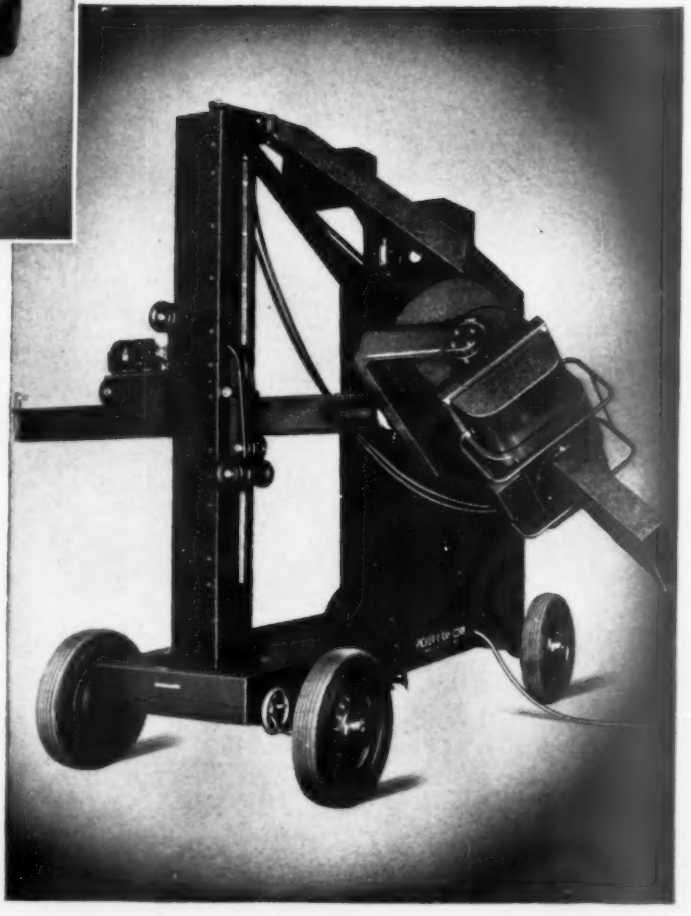
DeBothezat Bifurcators

DE BOTHEZAT VENTILATING EQUIPMENT DIVISION

American Machine and Metals, Inc. ★ East Moline, Illinois

FLEXIBLE POWER FOR INDUSTRIAL





1 **WIDE RANGE OF APPLICATION** (30 kv to 250 kv)—from light alloys up to four inches of steel (with screens).

2 **FLEXIBILITY AND MOBILITY**—Ease of positioning and adaptability to a variety of mountings—overhead crane, jib crane, dolly.

3 **HIGH SENSITIVITY**—Fine focus low absorption gives unusually fine detail and high sensitivity.

AL RADIOGRAPHY

with PICKER 250 KV. X-RAY UNIT

The design and construction of Picker 250 kv industrial x-ray units are based on an exhaustive study of the requirements of a great variety of industries needing non-destructive examination of their production.

The wide range of voltage—30 to 250 kv—gives these units a large field of usefulness. They provide complete radiographic facilities for a variety of materials and section thicknesses, from small light alloy castings up to three inches of steel without screens, or four inches of steel with screens.

The transformer-tube unit may be mounted on a mobile chassis, carried on an overhead or jib crane, or mounted on a dolly, thus providing suitable facilities for radiographic work in foundries, for pressure vessels, steel pipe welds, or assemblies.

The fine focus tube, with its low absorption radiation window, permits a degree of sensitivity heretofore unattained in industrial radiography.

☆ ☆ ☆

During 64 years of experience in the manufacture of high voltage apparatus, Picker-Waite engineers have pioneered many major developments in x-ray design and construction.

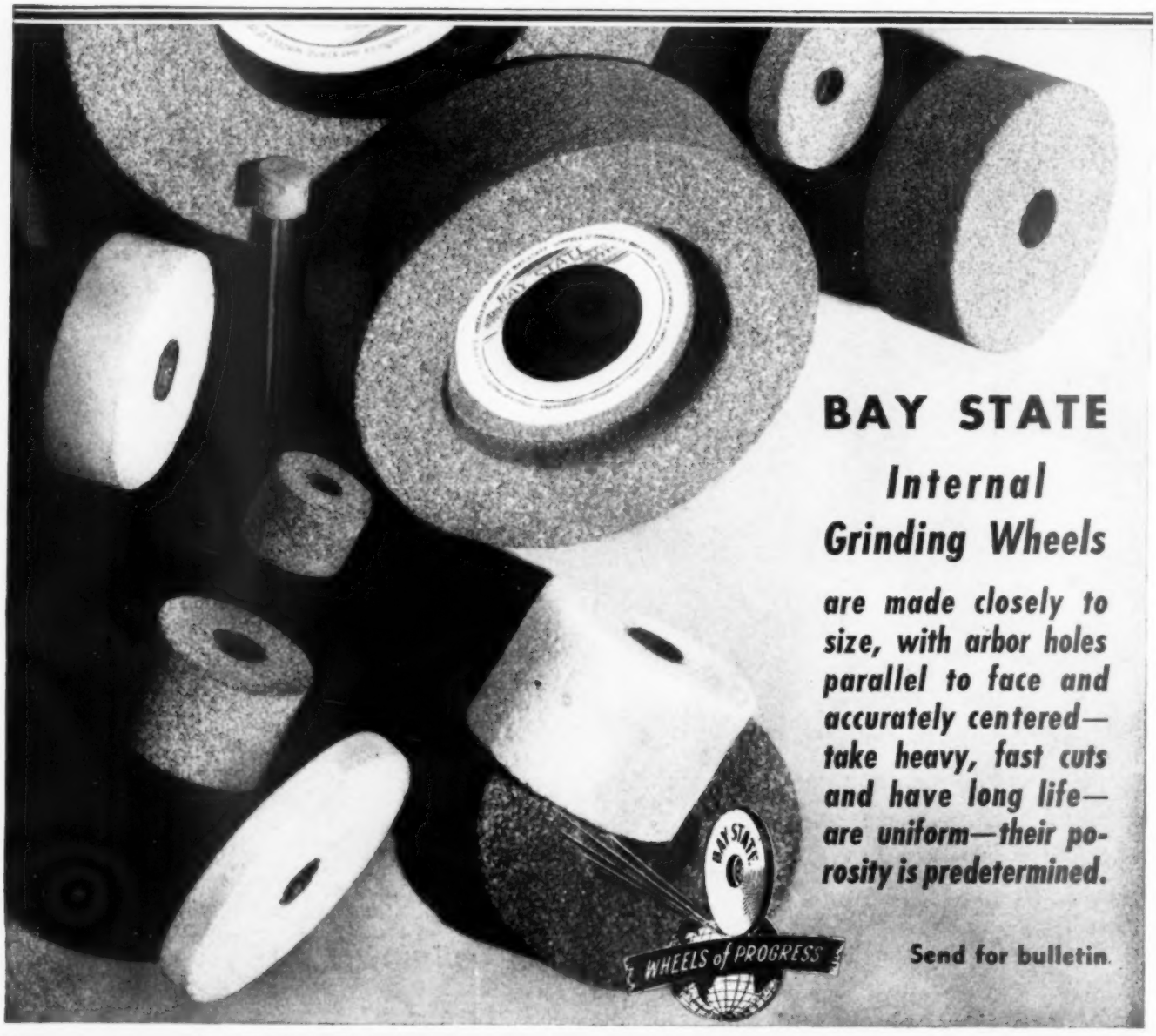
PICKER X-RAY CORPORATION

300 FOURTH AVENUE, NEW YORK, N. Y.

WAITE MANUFACTURING DIVISION, CLEVELAND, OHIO

MANUFACTURERS OF HIGH VOLTAGE APPARATUS SINCE 1879

For Little INSIDE JOBS



BAY STATE

Internal Grinding Wheels

are made closely to size, with arbor holes parallel to face and accurately centered—take heavy, fast cuts and have long life—are uniform—their porosity is predetermined.

Send for bulletin.

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

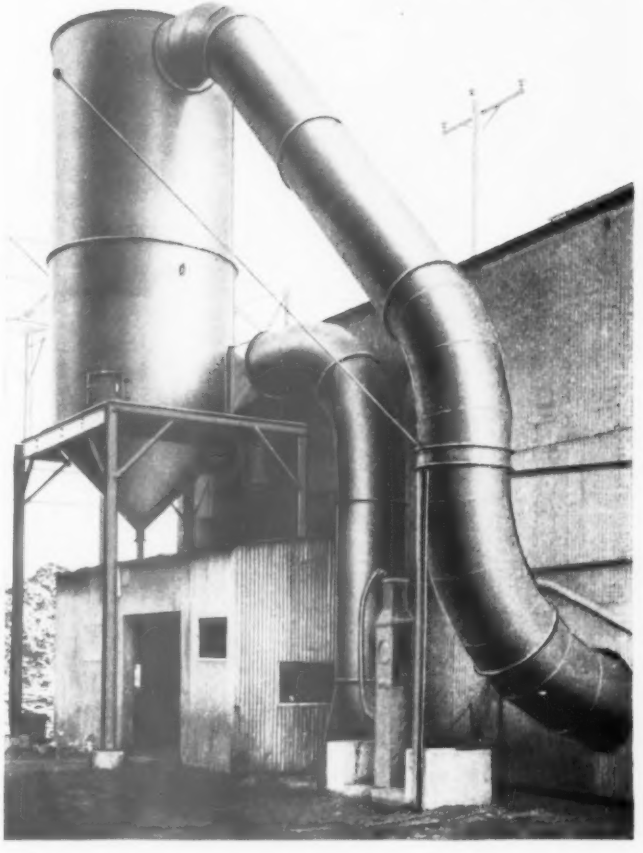
Clean Air 168 Hours A Week...

Maximum casting output—the goal of round-the-clock operation—can be attained only if the air in your foundry is kept free of dust and fumes 24 hours a day. Otherwise, there will be production lags on every shift. Dust collecting equipment, likewise, must function efficiently 24 hours daily, without interruptions for shakedown, cleaning, adjustment or repair. Schneible Multi-Wash Collectors are the full-time dust collectors which meet all requirements for continuous service in foundries of every type.

They use only water (oil for magnesium dust) as the medium for collecting and removing dust and fumes from contaminated air. There are no bothersome accumulations of dust to dispose of; no filters, screens or bags to clean and eventually replace; and need no time out for shakedown, adjustment or repair. Schneible collectors operate efficiently over long periods without attention, regardless of heat, cold or moisture. They have no moving parts; nothing to break, burn, clog or rapidly wear.

The water or oil used may be separated from the entrained solids with a Schneible Multi-Louver Dewatering Tank and used over and over again in the collector. The solids can be wasted or recovered.

Schneible modern-day equipment also includes "Uni-Flo" Dust Hoods for efficient collection of dust and fumes from shake-outs and troublesome dust creating operations; and "Wear-Proof" Pumps for handling abrasive laden water or oil.



Let us send you more information on what Schneible is doing in armament foundries. Ask for new Bulletin No. 143 on Schneible Multi-Wash Collectors and new Bulletin No. 842 on Schneible "Uni-Flo" Dust Hoods.

CLAUDE B. SCHNEIBLE COMPANY
3953 Lawrence Avenue, Chicago, Ill.
Engineering Representatives in Principal Cities

SCHNEIBLE

CAPACITY TO FIT YOUR BIGGER JOBS

Capacity to deliver plenty of low-cost air—plus the ability to keep horsepower requirements pared to the bone—are two big reasons why many foundry operators voice their approval of Gardner-Denver "RX" Single-Stage Horizontal Air Compressors.

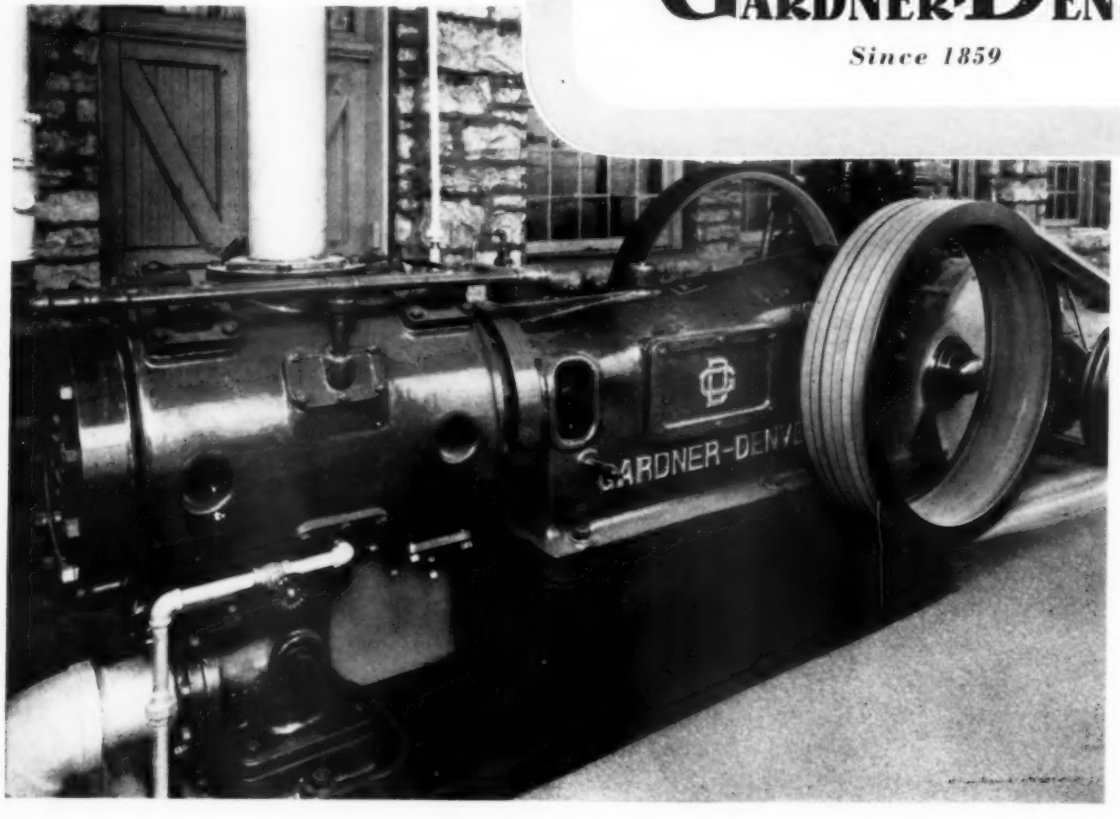
The "RX" is a smooth-running, low-maintenance machine—due to such features as rugged, dirt-free main frame—Timken roller main bearings—"Air Cushioned" duo-plate valves that actually become tighter with use. Designed with large and unrestricted valve and port areas, and extra large water jackets to insure high compressor efficiency.

For further information, write
Gardner-Denver Company, Quincy, Illinois

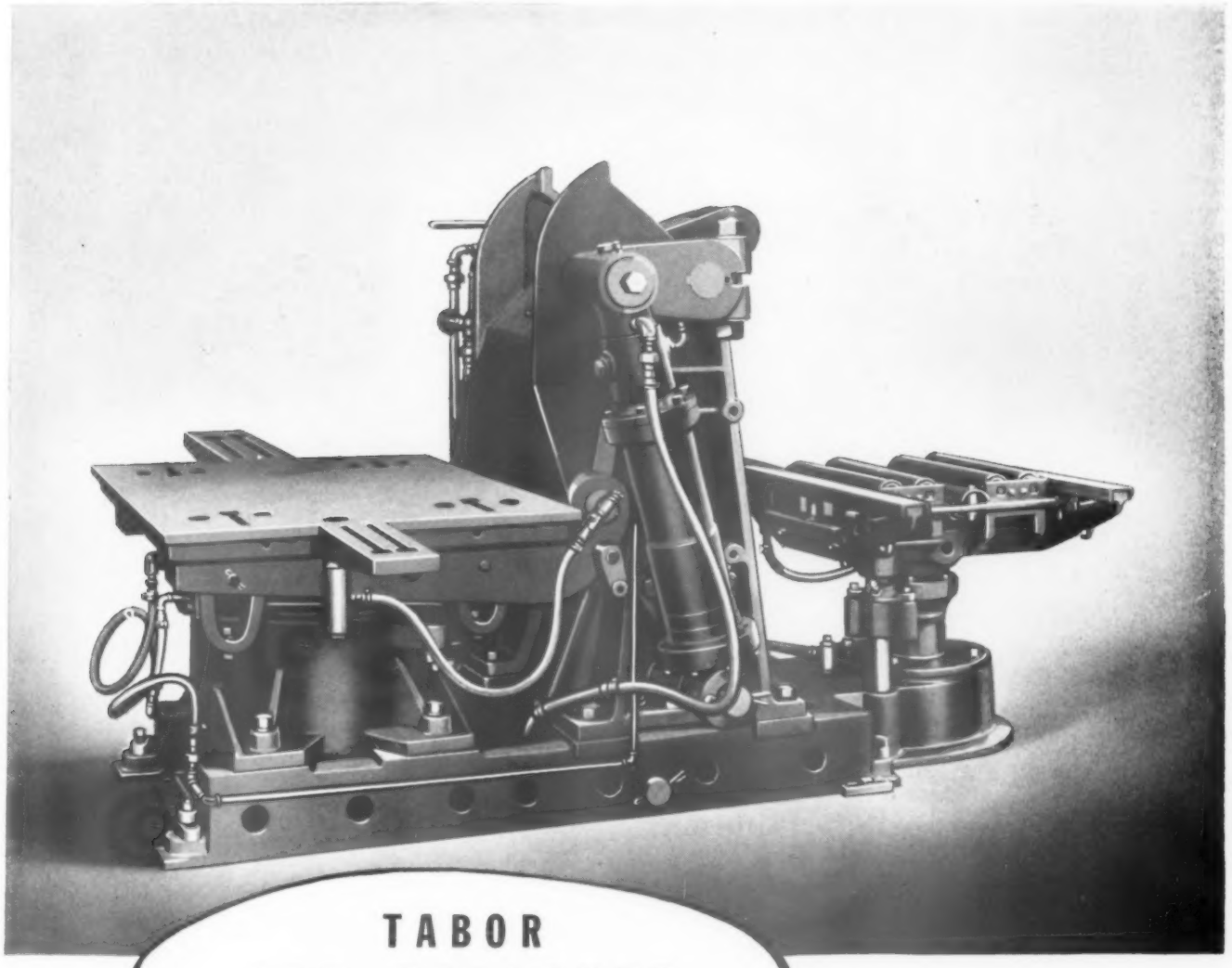
GARDNER-DENVER

Since 1859

Gardner-Denver "RX" Air Compressors are built in a capacity range from 89 to 1292 cubic feet displacement per minute—all sizes may be equipped for any type of drive.



Gardner-Denver B-72H Paving Breaker—a fast and powerful tool for the heaviest kinds of demolition work.



TABOR JAR ROLLOVER PATTERN DRAW MACHINES

▲ 36" Plain Jar, Power Rollover, Power Draw Machine. 15" Draw. Capacities to 2900 lbs.

Tabor machines handle jobs up to their full rated capacity in 35 seconds or less for a complete operating cycle. Ramming time is reduced to a minimum by the efficient Tabor jarring member . . . Rollover is oil controlled for maximum speed with absolute safety . . . Automatic leveling device handles any load with no possibility of shift . . . Draw is smooth at any desired speed by air-on-oil, and is accurate throughout the life of the machine.

Tabor Jar Rollover Pattern Draw Machines are furnished in all practical sizes; plain-jar or shockless-jar; with or without air-operated flask clamps; stationary and portable types. Bulletin 424 illustrates and describes the complete line.

TABOR
TRADE 1884 MARK

THE TABOR MANUFACTURING CO.
6225 Tacony Street
Philadelphia 35, Pennsylvania

Representatives: Snyder Foundry Supply Co., *Los Angeles, Calif.;* Pacific Graphite Works, *Oakland, Calif.,* Carl F. Miller & Co., *Seattle, Wash.*

The best known name in IRON

Brands:

BUFFALO

DETROIT

SUSQUEHANNA

Grades:

BASIC

FOUNDRY

MALLEABLE

FERRO-SILICON

SILVERY

NATIONAL STEEL

THE HANNA FURNACE CORPORATION

Buffalo Detroit New York Philadelphia Boston

Merchant Pig Iron Division of

NATIONAL STEEL CORPORATION

Executive Offices: Pittsburgh, Pa.

EWING GALLOWAY

AIR POWER

Think what a tremendous job it would be if you had to move a sand dune with a shovel and a wheelbarrow. Yet, when the desert winds are blowing, the sand dunes are continually shifting. Such is the power created by pressure differences in the atmosphere.

When the pressure differences are machine-made this remarkable form of power becomes *compressed air*. Used in many, many ways for industrial and processing purposes, this form of power has benefited mankind tremendously. Air compressors in thousands of sizes are producing millions of *air* horse-power for production and fighting fronts.

One of the most important uses of *compressed air* is the operation of **air tools** used by our nation's war industries. These tools are in such universal use because they are light in weight, durable, safe, easy to handle, and packed with a power that is easily regulated . . . all features enabling workers to improve their skill and increase production.

Industrial production problems require an assortment of *compressed air* equipment. Ingersoll-Rand has available many sizes and types of **air tools** for your selection. We also offer a complete line of compressors to supply air for countless other uses.

Ingersoll-Rand
11 BROADWAY, NEW YORK, N. Y.

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COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

Metallurgical TESTING EQUIPMENT

Designed for Speed and Accuracy

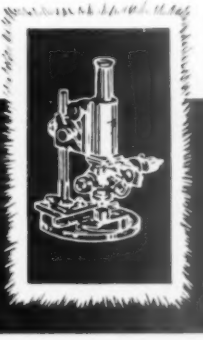
Bakelite and Transoptic mounts are quickly and accurately polished with the new De Luxe Polishing Stand No. 1516. The personal comfort and convenience provided by the De Luxe Polisher speeds production.

AB specimen Mount Press. No. 1315 with built in solid heating and split cooling units.

Daily contact with the problems of the metallurgist, over a period of years, enables our organization to design the right tools for each specific job. This specialization in the manufacture and distribution of equipment for all needs, means that Adolph I. Buehler provides one reliable source of supply for everything required by the modern metallurgical laboratory.

A complete line of equipment for the Metallurgical Laboratory

SPECIMEN MOUNT PRESSES • POLISHERS • POLISHING ABRASIVES • POLISHING CLOTHS • POWER GRINDERS • BELT SURFACERS • CUT-OFF MACHINES • HAND GRINDERS • CARBON METERS COLORIMETERS • HARDNESS TESTERS • DUST COUNTERS • DILATOMETERS • EMERY PAPER GRINDERS • LABORATORY CHAIRS • TITRATORS • MAGNIFIERS • METALLOGRAPHS • MICROSCOPES • STEREOSCOPES • PYROMETERS • REFRACTOMETERS • SPECTROGRAPHS • MACRO CAMERAS



Adolph I. Buehler

OPTICAL INSTRUMENTS ★ METALLURGICAL APPARATUS

228 North LaSalle Street, Chicago, Illinois

Always at Your Elbow—THIS MAN WHO KNOWS HIS IRONS

He is the Republic Pig Iron Metallurgist. He has an intimate knowledge of commercial irons. If you want to be technical, he can discuss grain structure; physical and chemical properties; melting, pouring and solidifying characteristics—any quality of the various types of iron from a scientific metallurgical viewpoint.

But more important, he is a practical foundryman who is familiar with foundry operations all the way from design and pattern making to the cleaning and grinding of the finished casting.

He's ready to step into your foundry to help you obtain the highest output from your present equipment. If you are having trouble at the cupola, on the pouring floor or in the finishing department, he probably has had experience with that very problem—and knows how to remedy it.

Just ask us to send a Republic Pig Iron Metallurgist. Once you've become acquainted with him, he will be "always at your elbow" when you need him.

REPUBLIC STEEL CORPORATION
General Offices: Cleveland 1, Ohio
Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Union Drawn Steel Division • Truscon Steel Company
Export Department: Chrysler Building, New York 17, N. Y.

Republic

PIG IRON

ALSO TRUSCON FOUNDRY FLASKS • REPUBLIC CORE WIRE • FOUNDRY NAILS

"CHATEAUGAY"
Low-Phosphorus, Copper-Free
"REPUBLIC"
(Northern)
Foundry, Basic and Malleable
"PIONEER"
(Southern)
Foundry and Basic

MECHANIZATION *is the answer*

WHITING

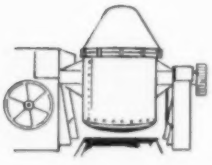
Labor-Saving Equipment for Foundries

•

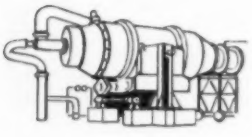
Whiting has supplied time- and labor-saving equipment for foundries for nearly sixty years. Its leadership in pioneering and development work has led to the general adoption of many Whiting innovations throughout the industry and is still showing the way to improved foundry practices and techniques.

•

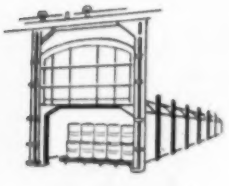
CONVERTERS



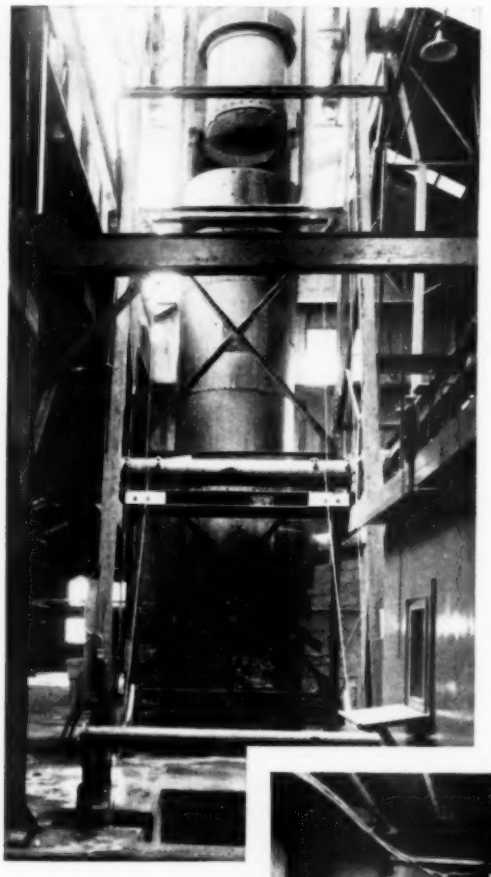
ROTARY FURNACES



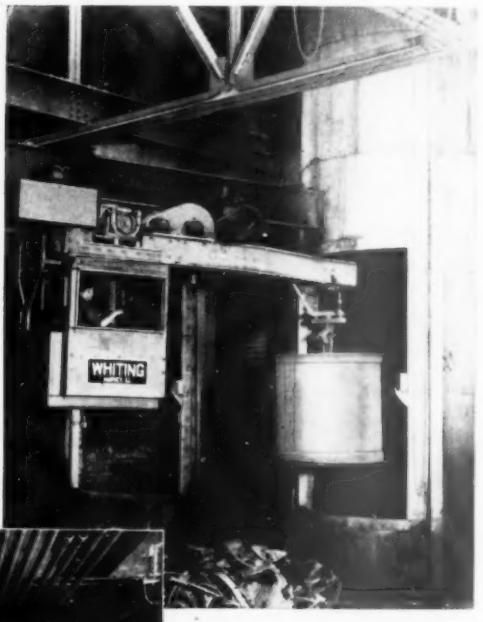
ANNEALING OVENS

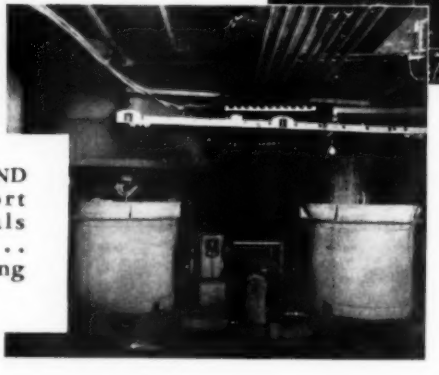


Let Whiting mechanized equipment take the place of dwindling manpower. With these specially engineered labor-savers, you can maintain production at peak capacity despite losses of men to the army.



MECHANICAL CHARGING—Foundries using Whiting Mechanical Charging Systems report big reductions in manpower needs. In one case, 21 fewer men are required in the charging crew for two cupolas. In another, 3 operators do the work formerly done by 18.

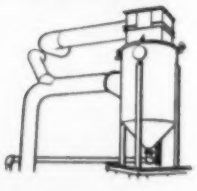




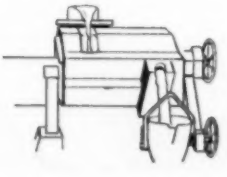
TRANSFER CARS AND TRUCKS transport charging materials quickly and easily . . . also used in handling finished work.

WHITING CHARGING EQUIPMENT is available for all foundries, large or small—inclined and vertical skips, as well as every crane type. Wishbone buckets distribute the charge.

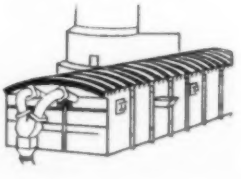
DUST SUPPRESSORS



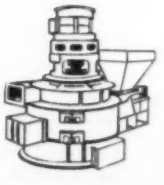
U-LADLES



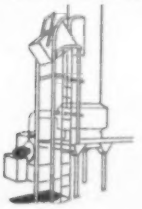
DUPLEXING



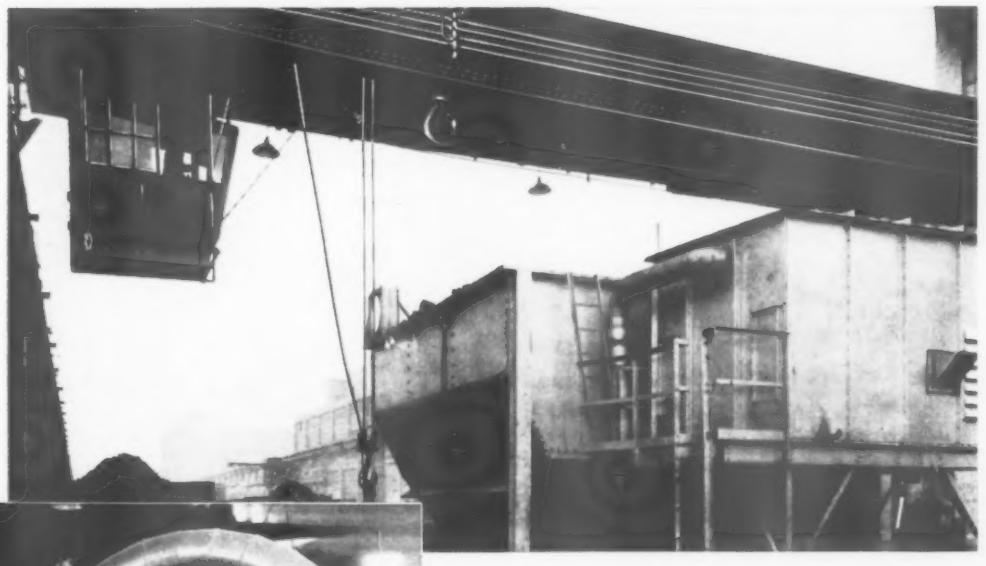
PULVERIZERS



CUPOLA and CHARGER



to Shortages of Manpower



CRANES—Whiting Cranes can save manpower in your materials-handling jobs. Cranes of every size and type are made for foundry use in material yards, charging operations, molding floors, core rooms, cleaning rooms, etc.

PULVERIZERS AND PULVERIZED COAL BURNERS for firing melting furnaces, annealing ovens, boilers, etc. Operation is completely automatic and in some cases it releases as many as three men from a single air furnace.

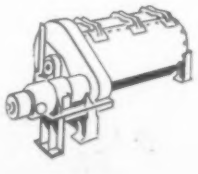
LADLES AND LADLE HANDLERS —Whiting Ladles may be operated with ease and safety. Whiting Ladle Handlers, featuring fingertip raising and lowering devices, permit one man to pour a large number of molds continuously with complete control.

ARMY E NAVY

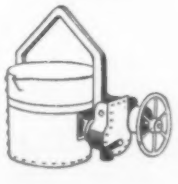
WHITING
CORPORATION

15607 Lathrop Ave., Harvey, Illinois

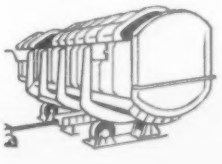
TUMBLERS



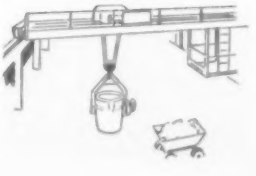
LADLES



CRADLE FURNACES

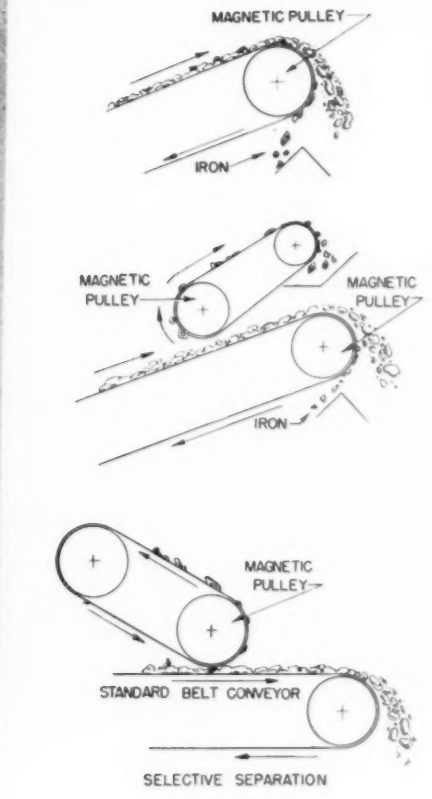


CRANES



Recently revised booklet of "Practical Hints on Cupola Operation" is available to users of Whiting Cupolas.

DINGS MAGNETIC PULLEYS—



FOR EVERY SAND HANDLING SYSTEM

THE diagrams at the right represent typical installations of Dings High Intensity Magnetic Pulleys for automatically removing iron from foundry sand. No matter what your method of handling sand, Dings engineers can show you how to adapt a pulley, or other Dings Separator, to your setup.

Dings air-cooled design helps keep the pulley coils cool, and for handling very hot sand, Dings Separators can be furnished with glass insulated coil wire which is resistant to high temperatures. Dings Separators will remove iron at any temperature short of red heat. (Red hot iron loses its magnetic properties.)

For full details on the separators to handle your job, consult "Separation Headquarters" now. Literature on request.

DINGS MAGNETIC SEPARATOR COMPANY
512 E. Smith Street • Milwaukee 7, Wisconsin

Dings MAGNETIC SEPARATION HIGH INTENSITY

To the FOUNDRYMEN of tomorrow

BINDERS

for Cores and Dry Sand Molds

Imagine the terrific shock to foundry sand when metal is poured into a mold — from room temperature to molten metal temperature in a matter of seconds.

Binders should be used in combination and quantity to assure proper functioning of the Cores and Molds throughout this entire temperature range.

Each Binder has definite characteristics at both low temperature and at high temperature — you cannot have one without the other.

Some Binders give strength with slow collapsing, while others give strength with fast collapsing.

Any rate of collapsibility can be secured by using the proper type and quantity of Binder, or combination of Binders.

J. S. McCormick Co. manufacture many types of binders.

McCormick service men are trained in the application and adjustment of sands and binders.

J. S. McCORMICK COMPANY

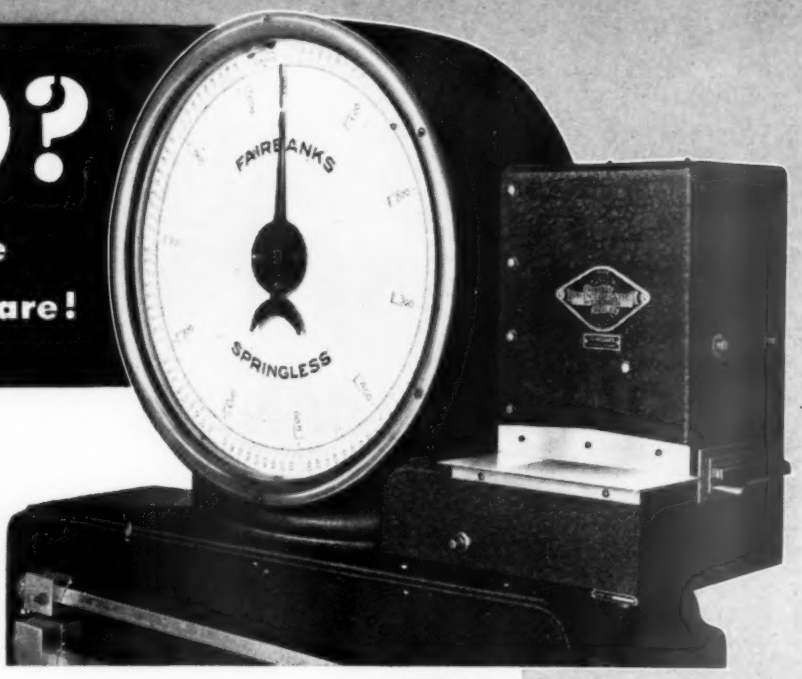
25TH STREET AND A. V. R. R.

PITTSBURGH, PA.

LION BINDER—EASY CLEANER CORE COMPOUND—IMPERIAL BINDER

GOOD?

They have to be to get where they are!

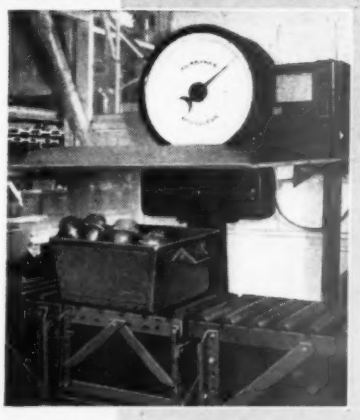


In good light or bad . . . operated by experienced weighmen or novices . . . weighing all kinds of commodities . . . Fairbanks Printomatic Scales have proved to the world that they have what it takes! They eliminate human errors, speed up weighing operations, and provide a PRINTED record showing what was weighed, who weighed it, and when.

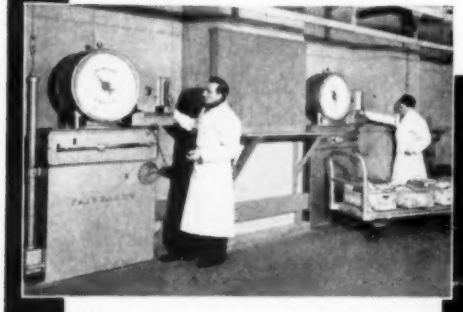
Fairbanks Scales have proved their reliability through their 113 years of service. Each part, carefully designed for its specific function and built with precision, guarantees your incoming, outgoing, and processing weight operations.

The Printomatic records the correct weight automatically, prints it on a roll tape, weigh ticket, or combination of both, or on gummed tickets. Adaptation of Fairbanks Printomatic Scales to weighing problems, simple or complicated, is practically unlimited. Why not investigate what these scales can do for you? Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

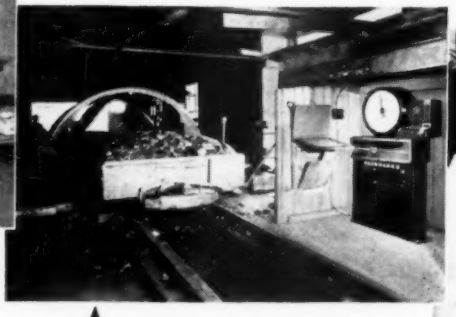
★



Fairbanks Printomatic Conveyor Scale → keeps printed record of piecework in foundry.



↑ Fairbanks Printomatics recording meat shipments to retailers. Each of 221 different kinds of meat is given a designating number.



↑ Fairbanks Coal Mine Car Scale with Printomatic weighs mine cars in motion, protecting employer and miner.

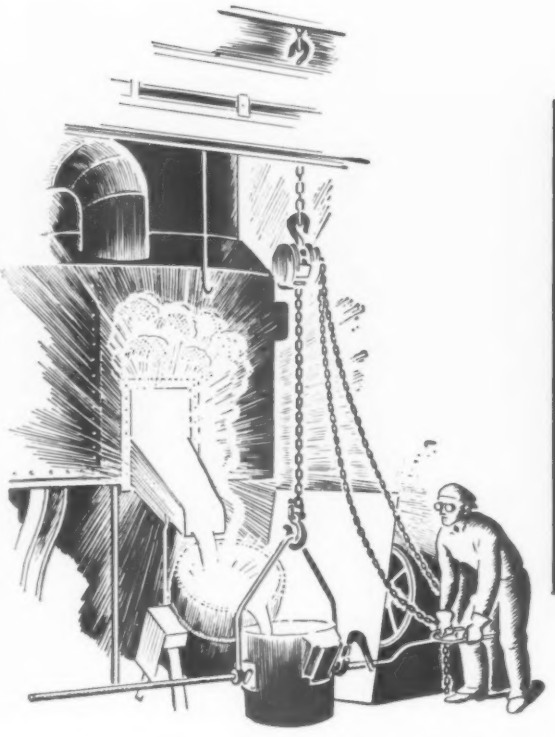
Fairbanks Portable Dial → Scale with Printomatic weighing and printing records of meat to retailers.

FAIRBANKS-MORSE Scales

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
SCALES

WATER SYSTEMS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS
RAILROAD EQUIPMENT

FAIRBANKS SCALES



Electromet Facts *for Foundrymen*

In addition to providing a full line of high-quality ferro-alloys and alloying metals, Electro Metallurgical Company can serve you in other important ways:

Experience—We have a background of over 35 years of experience in producing ferro-alloys, and our store of information on the use of alloys is available to the foundry industry.

Development—We maintain modern laboratory facilities for developing new ferro-alloys and for solving industrial metallurgical problems. Developments from this research include alloys for ladle and cupola additions, properly prepared to meet foundry needs . . . calcium-silicon, SMZ alloy, CMSZ alloy, S.M. ferrochrome, and EM silicon, chromium, and silico-manganese briquets.

Service—A staff of technically trained metallurgists render on-the-job assistance to foundrymen in the use of ferro-alloys. Because they have practical shop experience they are qualified to suggest the grades and sizes of alloys best suited for your particular use.

Literature—Booklets and reprints of technical articles give information of the correct use of ferro-alloys. Among these are "Chromium in Cast Iron," "SMZ Alloy and Its Uses," "Briquetted Alloys for the Cast Iron Foundry," and "Electromet Products and Service." Write for any of these that can help you.

Facilities—Our plants have been greatly expanded to meet the current demands for ferro-alloys. Warehouses and sales offices are strategically located throughout the major foundry districts to insure prompt shipments on emergency and normal orders. Electromet Ferro-Alloys and Metals are distributed through offices of Electro Metallurgical Sales Corporation in Birmingham, Chicago, Cleveland, Detroit, New York, Pittsburgh, and San Francisco. In Canada they are sold through Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

"Electromet," "CMSZ," "SMZ," and "EM" are trade-marks of Electro Metallurgical Company.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet
Trade Mark
Ferro-Alloys & Metals

ABRASIVE COMPANY

Victory Points

WITH DEMOUNTABLE SPINDLES

PATENT PENDING
★ ★ ★

Save Steel . . . for War Production

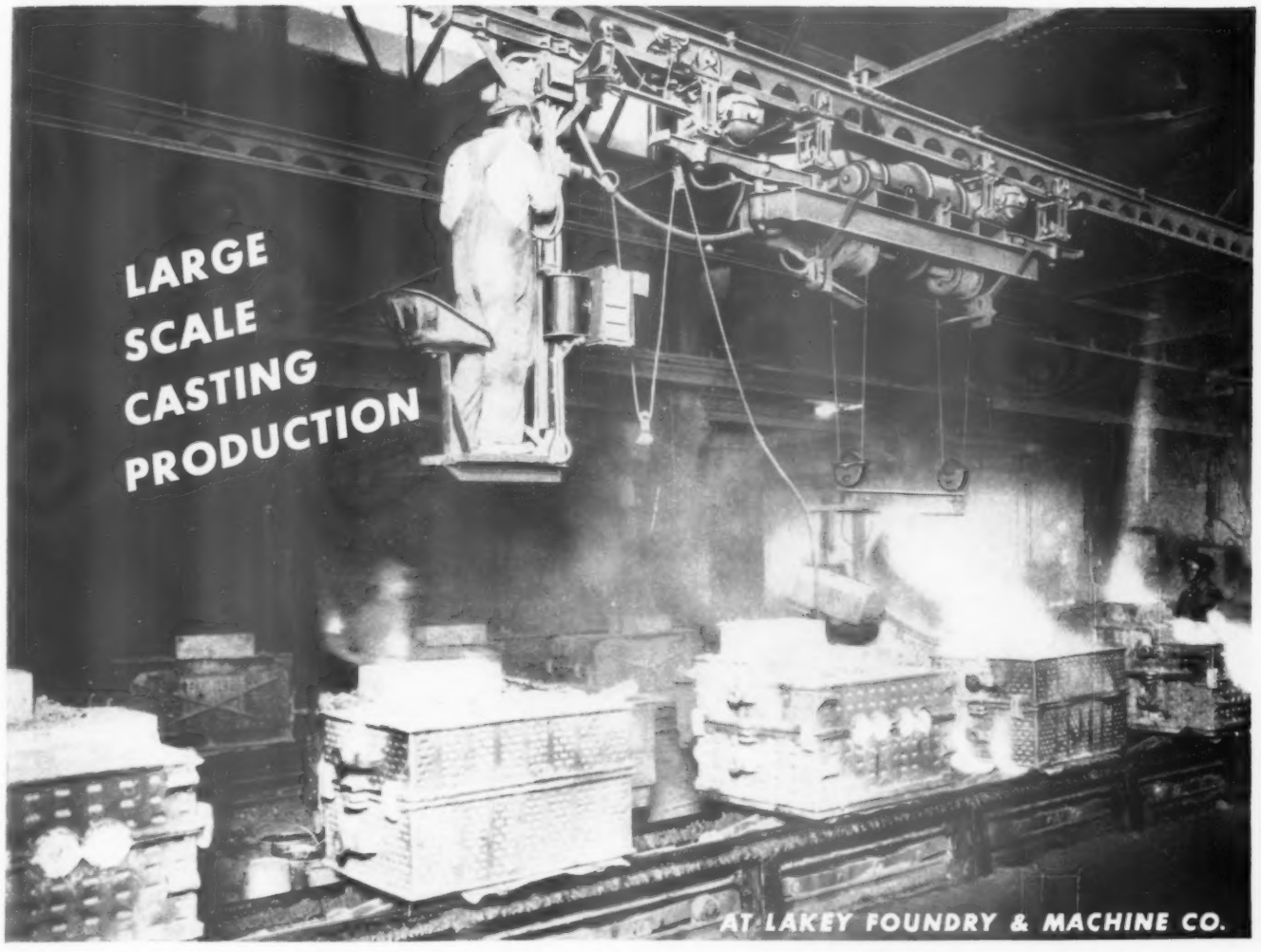
If you use Mounted Wheels and Mounted Points . . . switch to Abrasive Company new VICTORY POINTS . . . and save critical steel for war production! Their demountable, replaceable spindles permit quicker changing and greater convenience and more accurate work, since the spindle cannot pull loose, twist or turn.

For complete information about this outstanding new development write for our new bulletin on VICTORY POINTS, Form ESA-65.

ABRASIVE COMPANY

DIVISION OF SIMONDS SAW AND STEEL CO.

TACONY & FRALEY STS., PHILADELPHIA, PA. • DISTRIBUTORS IN ALL PRINCIPAL CITIES



Cleveland Tramrail is a very important factor in the production of casting at The Lakey Foundry & Machine Co., Muskegon, Michigan.

It makes possible a very high output of castings varying in weight from one-half pound to 1000 pounds.

Five 2-ton Cleveland Tramrail motor-driven platform-controlled carriers with hand-tilting ladles have the capacity to deliver 450 tons of molten iron per working day, direct from the cupolas to several continuous production lines where molds are traveling along on a drag-chain conveyor. They also supply hot iron to a line of 9 or 10 small floors which are serviced with smaller ladles.

Cleveland Tramrail equipment is used throughout many other departments such as core sand handling, core handling, pouring small castings, stoney shakeout, loading tumbling barrels and many miscellaneous small jobs where mechanical handling is found desirable.

Cleveland Tramrail permits taking the load directly to destination by the shortest route without hindrance from floor obstructions. No rehandling of hot metal is necessary. Hot iron reaches the molds with a minimum loss of heat.

The men are kept at a safe distance from the heat.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

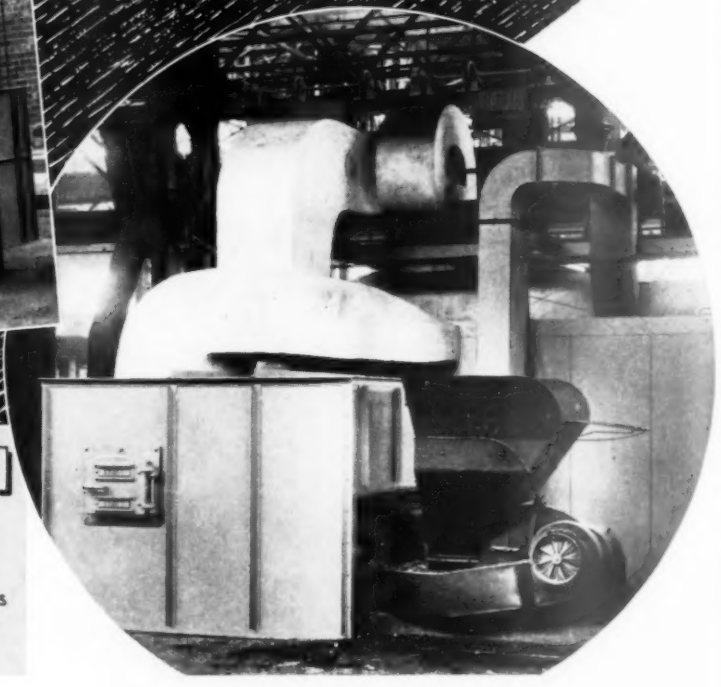
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1155 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

NOW ... FAST, PERFECT BAKING

COLEMAN CAR TYPE CORE OVENS
with stoker-fired external recirculating air heating systems.



COLEMAN
TRANSRACK CORE OVENS
with stoker-fired recirculating air heating system.

COLEMAN
STOKER-FIRED RECIRCULATING AIR HEATER
Built in several capacities to suit all foundry oven sizes and types.

COLEMAN CORE AND MOLD OVENS

THE FOUNDRY E
BUILDERS OF COLEMA ND
CLEVELAND O

G with COAL!

ARE you faced with a critical fuel situation because of oil or gas limitation in your district? Then turn to Coleman Ovens with coal fired recirculating air heating systems and maintain or expand your production.

Coleman Ovens of all types—Rolling Drawer, Transrack, Car and Conveyor, equipped with Coleman automatically stoker-fired recirculating air heating systems, are now in operation in leading foundries. Outstanding results are being obtained in every installation using either bituminous or anthracite coal.

Clean heat, fast and perfect baking and low cost operation guaranteed! Results equal to that of good oil or gas-fired systems.

Designed to permit easy conversion later on to oil or gas.

Time is short—investigate Now!

● Coleman "know-how" is proved by 8,000 successful installations and 40 years' experience.

There is a right type and size of Coleman Oven to best suit your requirements. Built for whatever fuel is most easily and economically obtainable in your district.

COLEMAN Portable Ovens
COLEMAN Rolling Drawer Ovens
COLEMAN Transrack Ovens
COLEMAN Car Type Ovens
COLEMAN Tower Ovens
COLEMAN Horiz. Conv. Ovens

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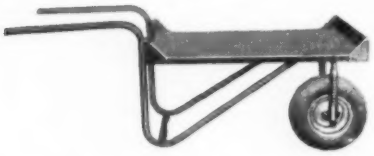
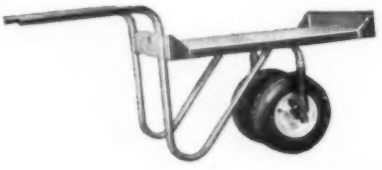
EMAN AND SWARTWOUT OVENS
ANLOHIO, U.S.A.

COLEMAN CORE AND MOLD OVENS

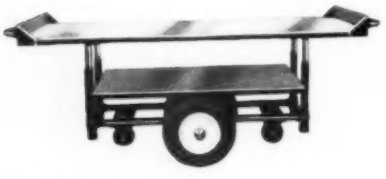


In crowded places throughout your foundry, this CMD Core Barrow, **Model C-1,** is mighty easy to handle.



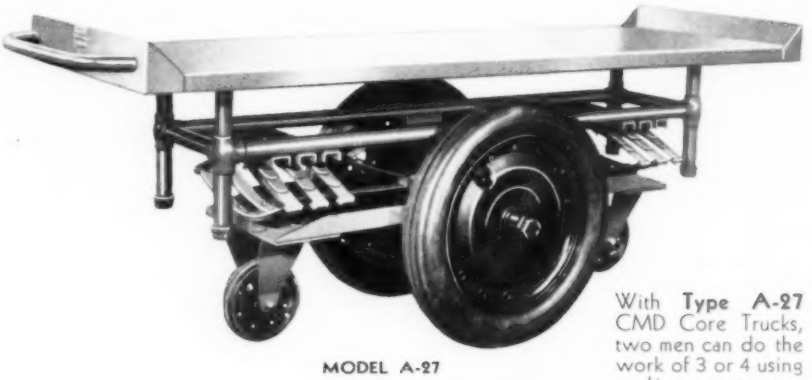
For heavier loads, the two-wheel CMD Pneumatic Core Barrow, **Type C-2,** provides easy maneuverability with extra strength and full protection for cores.

Light and heavy loads can be carried with complete safety by the sturdily built **Model A-27-J** Core Truck. Loading platform is 27" x 60" long. Loading capacity is 600 lbs. Elliptical springs and inner coil springs in the uprights assure correct resiliency.



Model D-1 Core Truck has two loading trays and is sturdily built to give years of service at moderate cost. Load capacity, 600 lbs.

The resilient chassis of **Type B-1** Core Truck is made of spring steel properly heat-treated and includes intermediate elliptical springs for maximum cushioning protection. The solid rubber tired, steel-spoked wheels have Hyatt Roller Bearings. Load capacity, 700 lbs.



MODEL A-27

With **Type A-27** CMD Core Trucks, two men can do the work of 3 or 4 using ordinary conveyances. Bench-high steel trays speed loading. Three sizes for load capacities of 800 lbs., 1000 lbs., and 1,200 lbs.

FOR *FASTER and SAFER* DELIVERY OF CORES

USE PNEUMATIC CORE TRUCKS

This exclusive coil spring construction (found only in CMD Trucks) assures maximum resilience even under light loads.

You can reduce core handling costs 50 to 75 per cent and minimize chafing and core breakage with CMD Pneumatic Core Trucks and Core Barrows. Pneumatic tires absorb the major jolts while specially designed springs cushion the load against vibration. CMD core conveying equipment reflects 22 years of experience in meeting the specialized needs of the foundry industry. There are models and sizes for every requirement. Write for the new four page catalog on CMD Core Trucks and other foundry supplies.

CHICAGO MANUFACTURING & DISTRIBUTING COMPANY

Dept. 8F, 1928 West 46th St. Chicago, Ill.

Manufacturers of a complete line of core-conveying equipment and foundry specialties.

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P.O. BOX 5755
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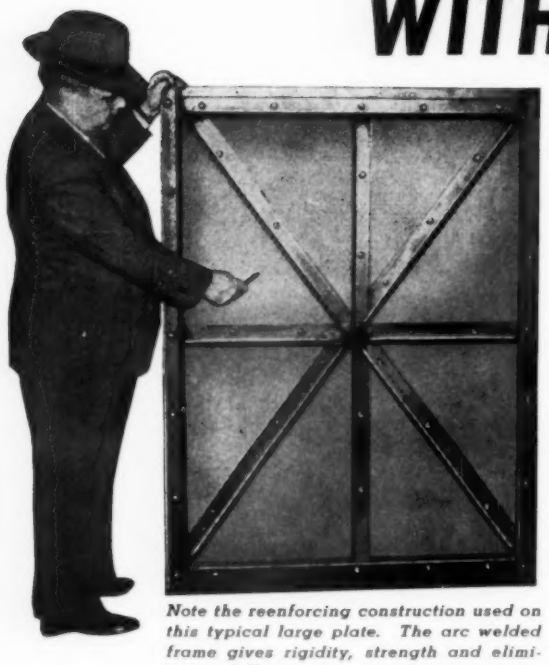
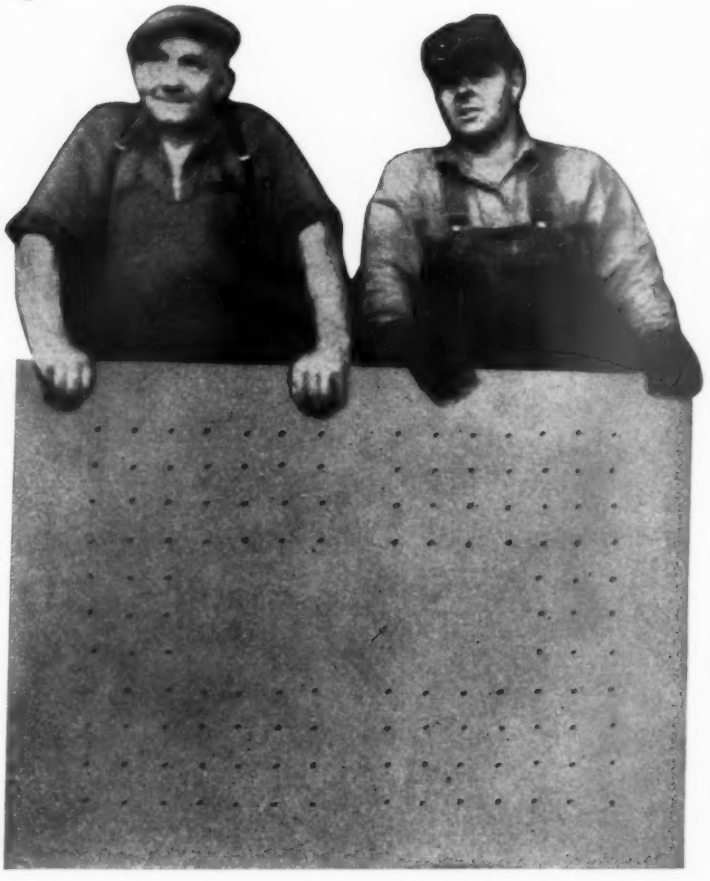
CARRY CORES UP TO 1200 LBS. WITHOUT DEFLECTION!



Note the reenforcing construction used on this typical large plate. The arc welded frame gives rigidity, strength and eliminates deflection.

IT IS BEING DONE ON DIAMOND REENFORCED STEEL CORE PLATES

These special core plates are designed to carry large cores up to 1200 lbs., cores of any size, without deflection or warping.



You may obtain Diamond Core Plates to suit your own special requirements. They are furnished with or without perforations and in all smaller, standard sizes—plain or reenforced as indicated by your needs.

Send us detailed information on your core baking problem and we'll be glad to design a plate to handle the job. Weight of core and dimensions, in particular.

DIAMOND

CLAMP AND FLASK COMPANY

Telephone 2553 **Richmond, Indiana**

Designers of CORE PLATES, JACKETS, BANDS, FLASKS since 1889

An old name in Aluminum

A new refining source for Alloys

Aluminum Refiners

Division of

BOHN ALUMINUM AND BRASS CORPORATION, DETROIT, MICHIGAN

General Offices: Lafayette Bldg.

MANUFACTURERS OF ALL TYPES AND SHAPES
OF CASTING AND DEOXIDIZING ALLOYS

BUY
WAR
BONDS

PLANNING FOR THE FUTURE

In connection with this country's gigantic war production a large percentage of the products of the foundry industry will be required and diverted to government needs and specifications will be rigid.

Our own production has been largely allocated to essential industries by the government. For that reason we are often in the regrettable position of being unable to furnish just the proper grade of Silvery for a particular requirement or, perhaps proper priority is not available, no Silvery at all.

We can, however, and will be glad to give the foundrymen the benefit of more than 50 years' experience in the manufacture and use of Silvery Pig Iron.

To those required to meet rigid government specifications we offer experienced metallurgical service. To those who find it necessary to use a grade of Silvery different from what they have had in the past we will help to adjust their mixes to utilize the new grade in the most efficient manner. To those unable to secure Globe Silvery Iron we will help in the use of what substitutes may be available until such time as we can again supply them.

The best plan for the future is to do the best job now. We can and want to help you.

BESSEMER FERRO-SILICONS
GLOBE IRON COMPANY
JACKSON OHIO
JACKSON COUNTY SILVERIES
SPECIAL HIGH SILICON GRADES

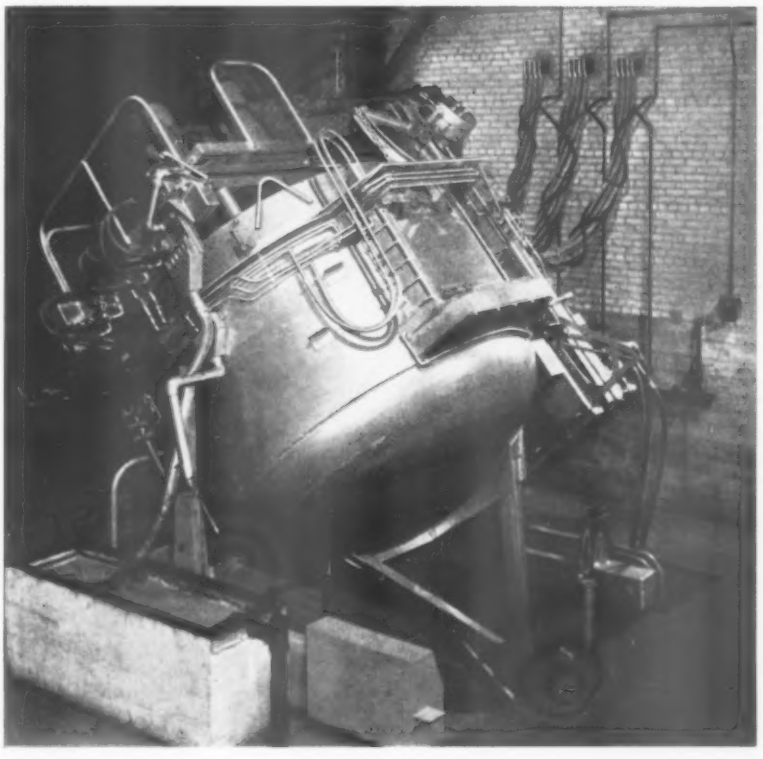
GLOBE IRON CO.

JACKSON, OHIO

FOUNDED 1872

The only Electric Melting Furnace HAVING HYDRAULICALLY POSITIONED ELECTRODES

Hydraulically positioned electrodes offer many advantages. For many years, manufacturers of arc melting furnaces totally disregarded accuracy in positioning electrodes. Large reversing electrode motors, plus lengthy stretchable cables, plus ponderous arms, form a heavy handicap quickly to adjust an arc, when motors say move.



Size 12 MT Top Charge Electric Furnace

This is HYDRO-ARC'S *answer:*

1. Air counterbalancing of electrode arms. Air has no weight. Our use of air "up-push" to balance and move an electrode arm cuts our movable weight in half at the very start. Thus, with strong construction we have the lowest inertia to aid in quick electrode moving. No air is wasted or exhausted.

2. Hydraulic fluid is neither compressible nor stretchable. When the motors say MOVE, the electrodes respond instantly.

3. Because our motors have to move only the comparatively small difference between air "up-push" and arm weight, we may use small motors, which are not allowed to surge above rated load. This combination means: fastest accurate electrode positioning, least carbon electrode wash, lowest electrode usage, least transformer sustained surging, least transformer heating and best transformer power factor.

Another significant advantage of Hydro-Arc furnaces is power-operated electrode clamps. Write for an engineering bulletin giving complete details.

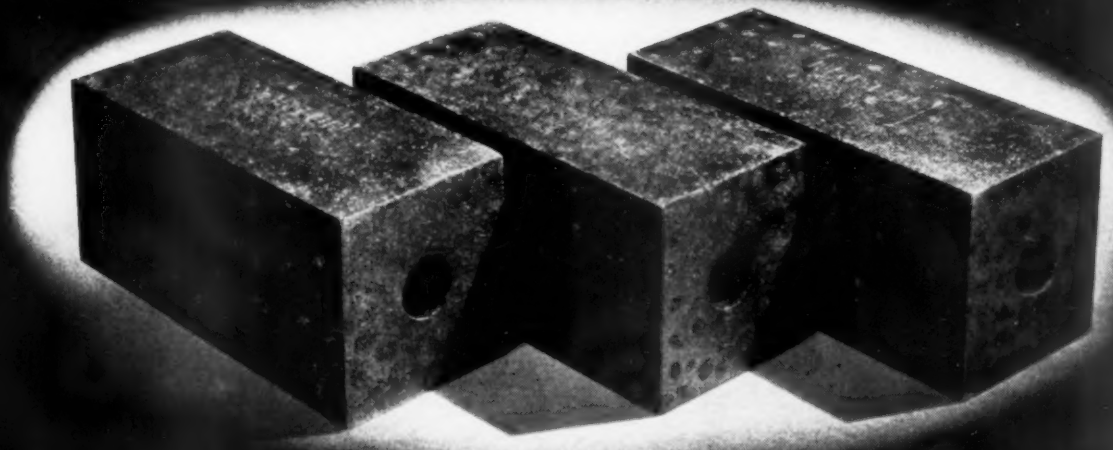
HYDRO-ARC
FURNACE CORPORATION

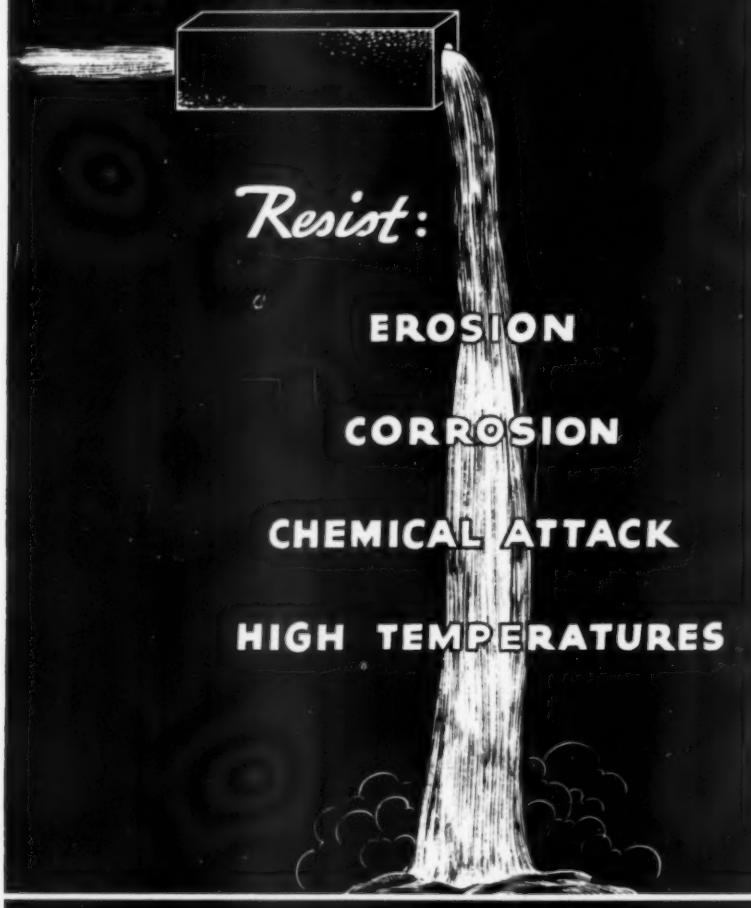
561 HILLGROVE AVENUE, LAGRANGE, ILLINOIS (A Suburb of Chicago, Illinois, U. S. A.)
TELEPHONES: LA GRANGE 4545 AND 4546 CHICAGO LINE: ENTERPRISE 1068

Associated with Whiting Corporation

CRYSTOLON slag-hole blocks

-giving longer service to gray iron foundries



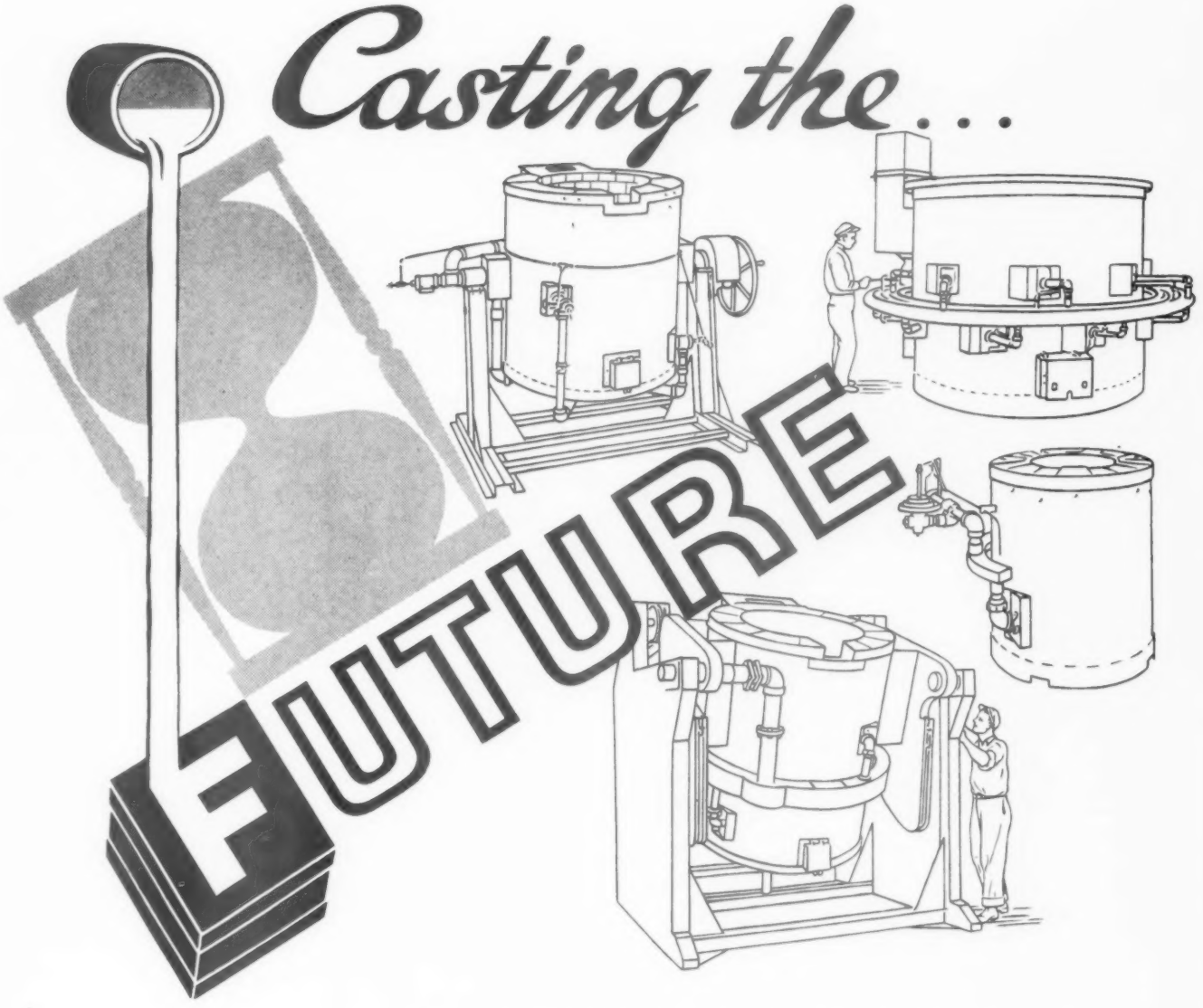


CRYSTOLON Slag-Hole Blocks, made of densely bonded silicon carbide grain, present a smooth, non-permeable surface which resists all slag action, either by corrosion or erosion. These rugged, chemically inert blocks will not soften nor spall at temperatures up to 1650°C. The result: longer service from CRYSTOLON Slag-Hole Blocks.

NORTON COMPANY
Worcester - Massachusetts

Norton ELECTRIC FURNACE FUSED Refractories

Casting the...



—is a responsibility of the present. Answers to requirements unpredicted a few years ago have been found in new alloys, new metals and new methods. New problems have been solved years ahead of time and the results are scheduled to play an important part in the world of tomorrow. These new developments have challenged the efficiency of foundry equipment and layout, outmoding old standards.

Pioneering new and higher standards that are "casting the future" Fisher has met the challenge to the point that you would not recognize the Fisher family of furnaces of today compared to the best available a few short years ago.

The result is an entirely different approach to quality and quantity of production with significant improvement in economy and convenience of operation.

Present your Foundry Equipment and Lay-out problems to Fisher. Write for complete information.

5519 N. WOLCOTT AVE., CHICAGO, ILLINOIS

Fisher FURNACE COMPANY

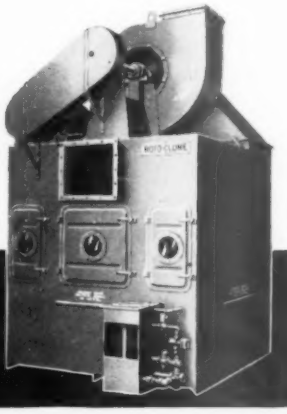
Safe MAGNESIUM DUST CONTROL

TYPE N ROTO-CLONE provides absolute safety in the handling of magnesium dust generated by grinding, polishing, buffing and abrasive cleaning operations.

The dust is precipitated under liquid and stored as sludge. There are no restrictions, ledges or recesses in the unit where damp magnesium dust could be deposited to create a fire hazard.

Type N Roto-Clone is available in a variety of types and sizes to serve individual dust sources or central system exhausts as conditions demand. Illustrated is the individual stand type which recirculates clean air back into the work room. If you have a magnesium dust problem, write for Bulletin No. 277 which will be sent without obligation.

Below: Unit Type N Roto-Clone Class 500, size No. 6, 6000 cfm. For service with central system exhausting from a number of dust sources.



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AAF AMERICAN AIR FILTERS

AMERICAN AIR FILTER CO., INC.
INCORPORATED
266 CENTRAL AVE. LOUISVILLE, KENTUCKY
IN CANADA, DARLING BROTHERS, LIMITED, MONTREAL, P. Q.

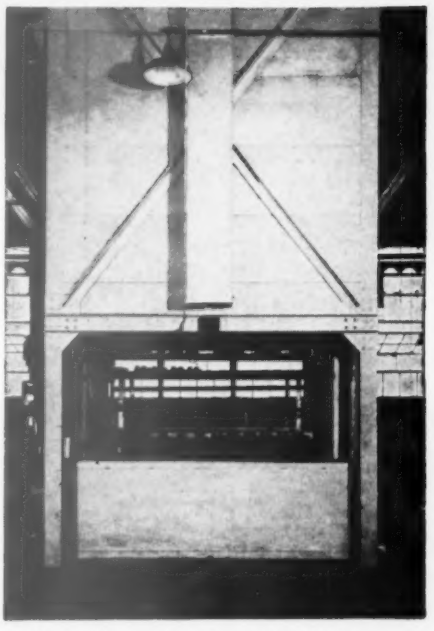
In face of wide competition....

CARL-MAYER
CORE and MOLD OVENS

..are chosen by concerns of national prominence!

● Carl-Mayer Core and Mold Ovens have attained their high position in the foundry industry because of their ultra-modern design, exclusive recirculating air heater system and high grade rugged construction.

Wire or write for illustrated Bulletin 141, or a Carl-Mayer Oven Engineer.



Typical large Carl-Mayer Vertical Oven as installed for General Motors, Electric Autolite, Cadillac and other outstanding foundries

Three new Continuous Monorail Core Ovens similar to this, for Ford Airplane Engine Plant.

CARL-MAYER, 3030 Euclid Ave., Cleveland, Ohio

Over 20 Years' Experience

All Types **CARL-MAYER CORE AND MOLD OVENS** *All Sizes*

SERVING CONCERNS LIKE *these:*

Aluminum Co. of America
American Magnesium Corp.
American Radiator & Standard Sanitary Corp.
Babcock & Wilcox Co.
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Eclipse Aviation Division of Bendix Aviation Corp.
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General Motors Corp.
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International Heater Co.
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Whiten Machine Works
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CLEAN CASTINGS
INCREASE PRODUCTION

TAM FOUNDRY ZIRCONITE SAND YIELDS SMOOTH CASTINGS AND REDUCES CLEANING TIME

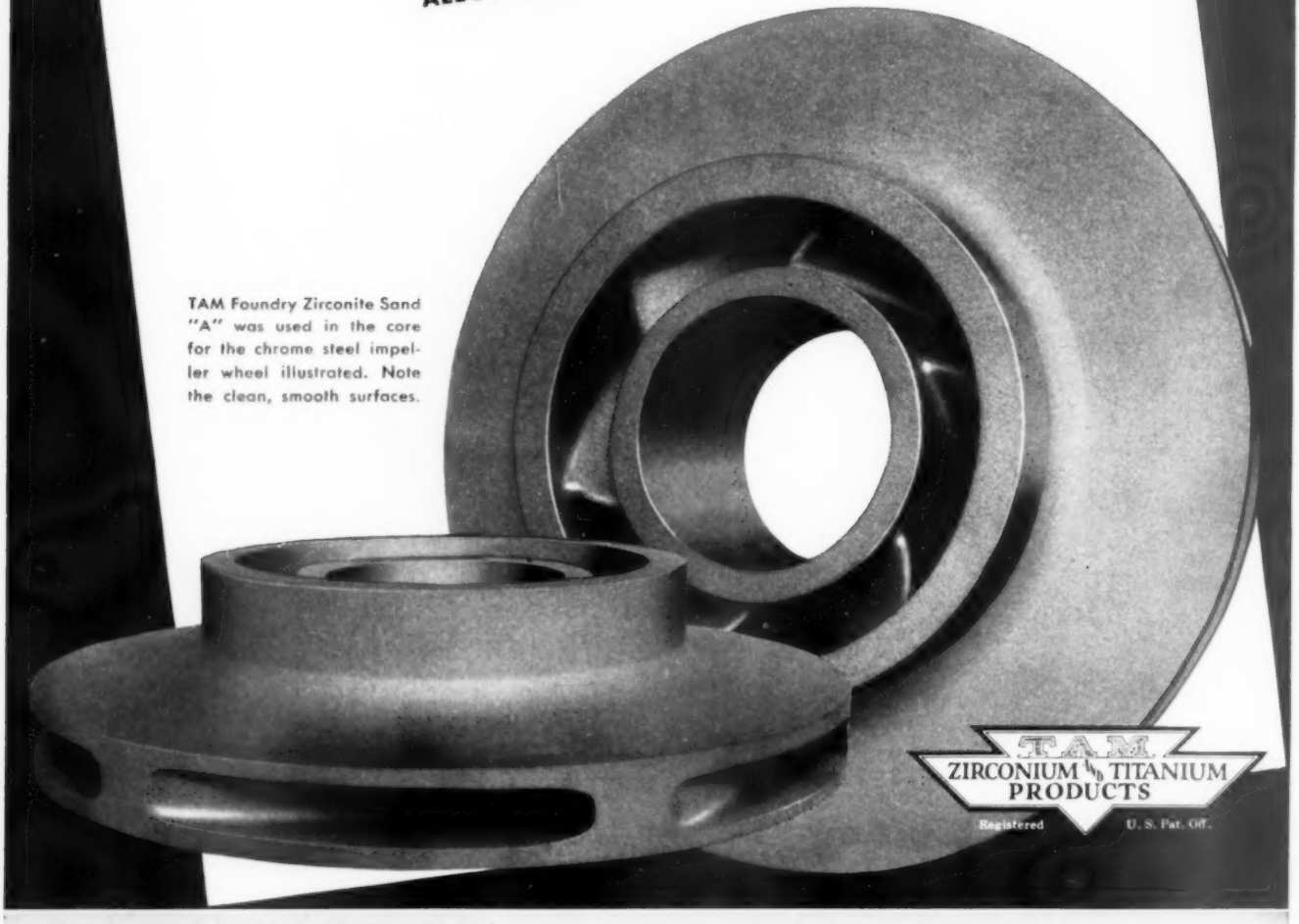
TAM Foundry Zirconite Sand used for the entire mold or as a facing sand resists the burning in of the metal and makes possible the production of clean castings and the expansion of output by reducing time in the cleaning department.

TAM Foundry Zirconite Sand does not warp, requires minimum venting and the faster chilling permits better metal distribution into heavy sections and reduces "hot tears"! Four important factors.

TAM Foundry Zirconite Sand is available in three grades, Zirconite Sand A has an approximate melting point of 3812° F. Zirconite Sands B and C 3650° F.

Full particulars on the proper applications of Foundry Zirconite Sands will be sent immediately upon request. Write:

TITANIUM
ALLOY MANUFACTURING COMPANY



TAM Foundry Zirconite Sand "A" was used in the core for the chrome steel impeller wheel illustrated. Note the clean, smooth surfaces.

TAM
ZIRCONIUM AND TITANIUM PRODUCTS
Registered U. S. Pat. Off.

GENERAL OFFICES AND WORKS: NIAGARA FALLS, N. Y., U. S. A.
EXECUTIVE OFFICES: 111 BROADWAY, NEW YORK CITY

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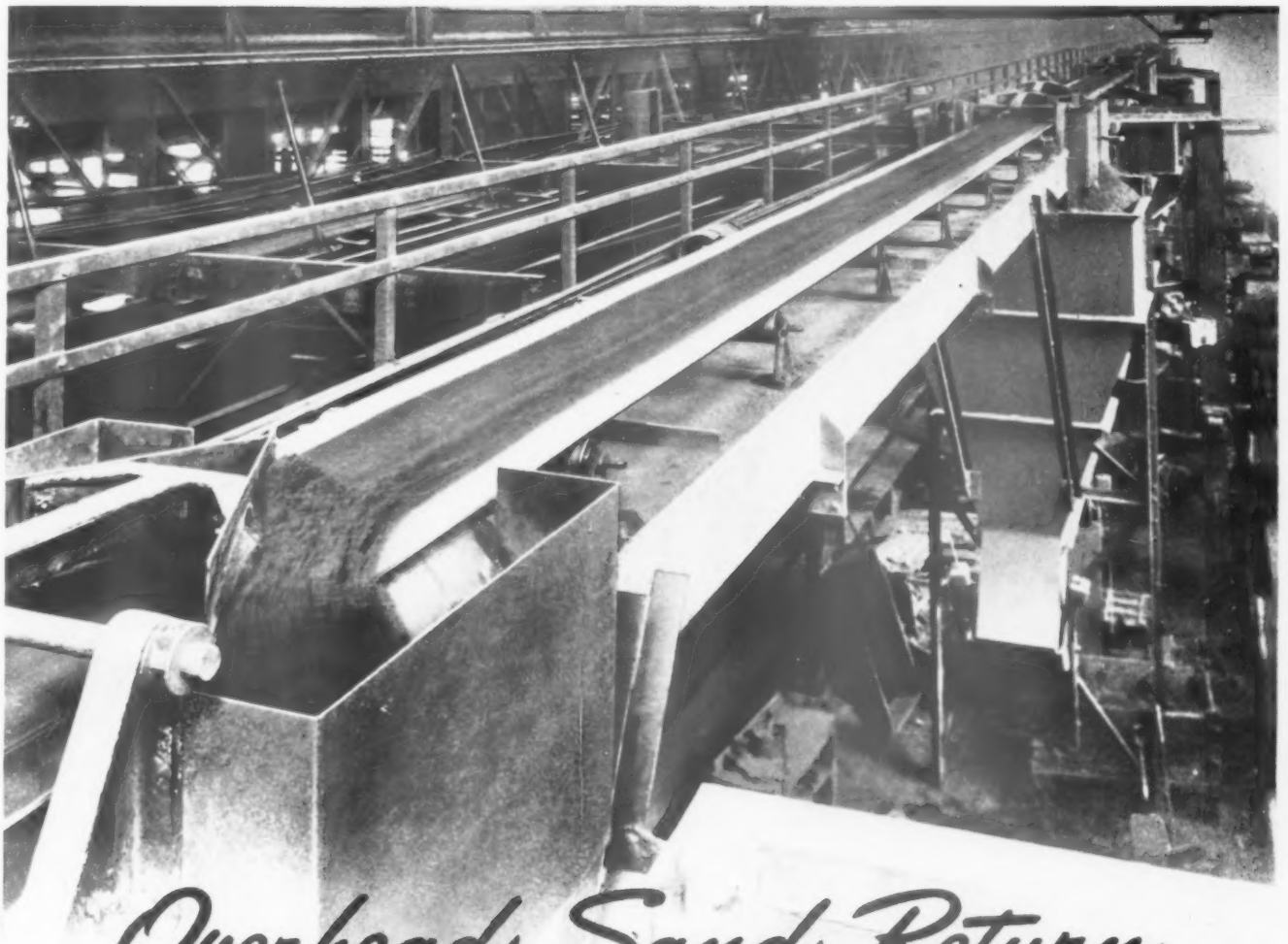


Overhead Sand Return

saves valuable floor space for other work

● Bartlett-Snow Overhead Distributing Systems for returning tempered sand to the molders, permit a much more orderly and more profitable operation then would otherwise be possible.

For belt distributing systems,—usually preferred when sand is to be distributed to a relatively small number of large hoppers—Bartlett-Snow has developed special troughing and flat idlers specially for foundry service. The discharge is effective with either one-way or two-way plows,—designed to minimize belt wear.

Flight distributing systems, used preferably for filling a long row of small molder's hoppers, or to avoid the spillage sometimes encountered from the return run of a belt distributor, can be arranged to carry sand in both directions if desired.

Our recently issued 40-page Foundry Bulletin No. 91, which illustrates many different arrangements of distributing systems—and other Bartlett-Snow Foundry Equipment, will be of great interest to every foundryman. Send for a copy!

THE C. O. BARTLETT & SNOW CO.

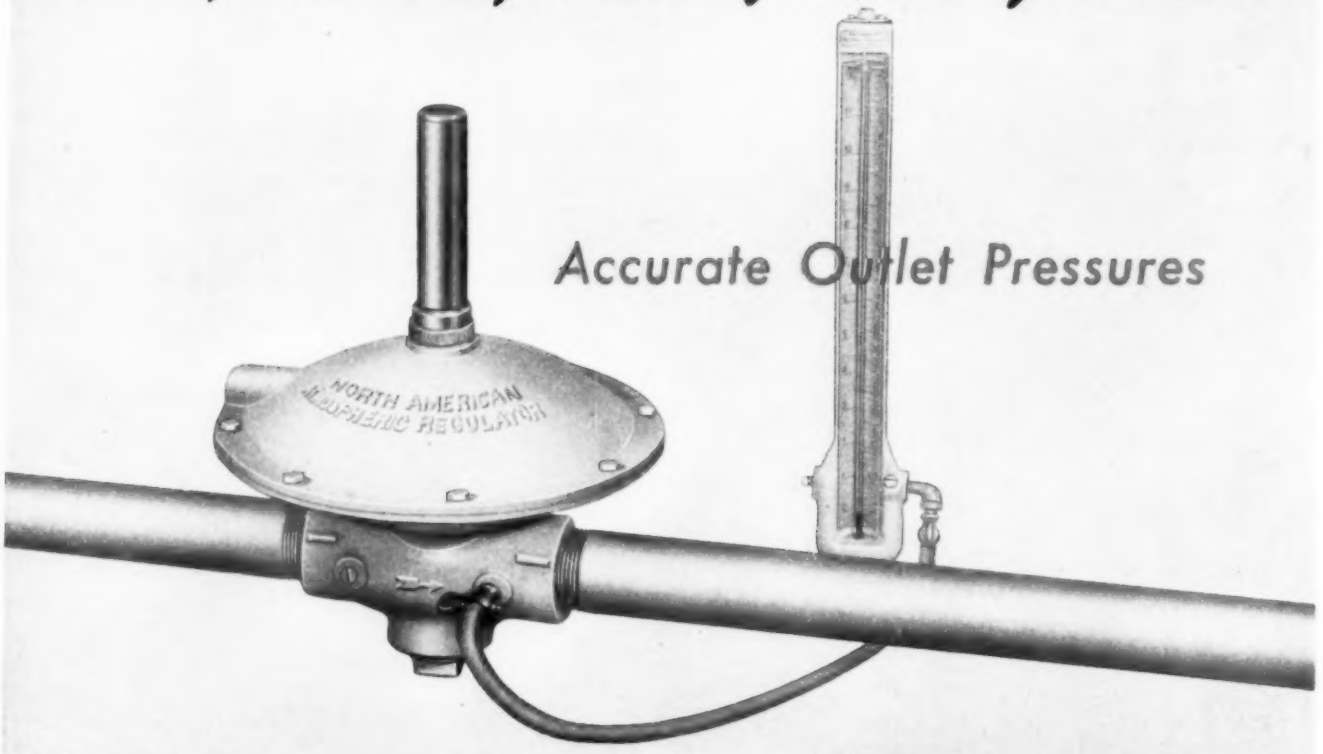
6201 HARVARD AVENUE • CLEVELAND, OHIO

Engineering and Sales Representatives in the Principal Cities

FOUNDRY SAND, MOLD AND CASTINGS HANDLING • • DUST AND FUME CONTROL SYSTEMS • •

NORTH AMERICAN

Atmospheric Regulators for Air-Gas Ratio



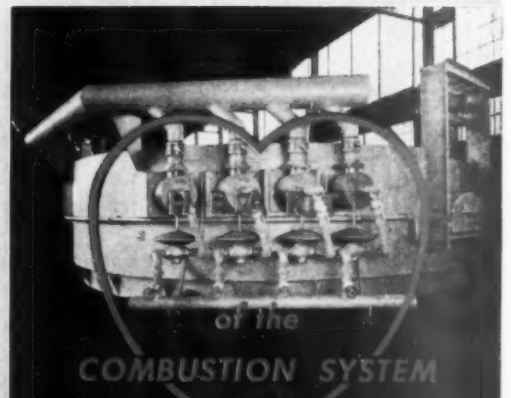
Accurate Outlet Pressures

Because—

In the NORTH AMERICAN Pressure System of fuel-air proportioning, the air valve controls the amount of fire. The fuel-air ratio remains constant because of the excellent operating accuracy of the NORTH AMERICAN Atmospheric Regulator. Any change, however small, in air pressure produces a proportional change in the flow of gas.

The NORTH AMERICAN Atmospheric Regulators are precision-built instruments—each one carefully checked and tested under actual operating conditions at the factory. A special flexible joint between valve and valve stem, special synthetic diaphragms, and a 1 to 1 ratio of the areas of the valve and small diaphragm are three additional reasons for the extreme accuracy of performance.

"NORTH AMERICAN for COMBUSTION"



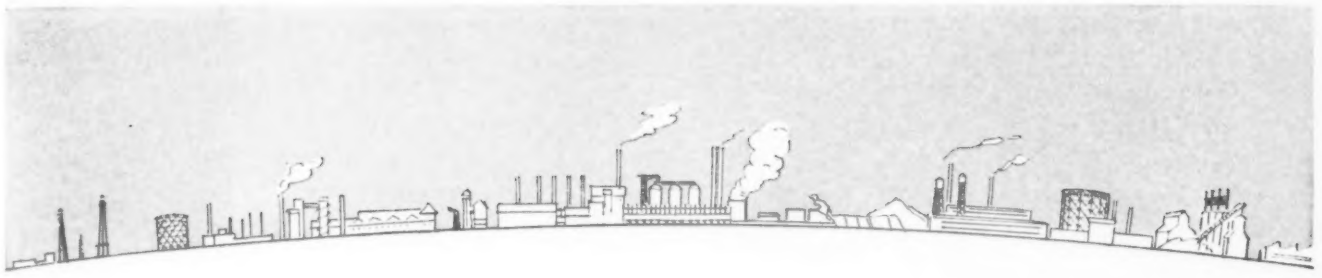
Constant and correct gas-air ratio gives maximum heat for the amount of gas burned and uniform product resulting from constant furnace atmosphere.

THE NORTH AMERICAN MANUFACTURING COMPANY

MANUFACTURERS OF INDUSTRIAL FUEL BURNING EQUIPMENT FOR GAS OR OIL

BRANCH OFFICES *with* FIELD ENGINEERS *in* PRINCIPAL CITIES

CLEVELAND, OHIO



LISTENING IN ON INDUSTRIAL AMERICA

WITH "ears" as big as those of a listening post at the battle front we are catching sounds of a stirring, restlessly active industry—the sounds of plan making for the world stimulating changes of the coming post war era.

New processes, new materials and new equipment are already being developed and perfected to provide for a far higher standard of living. Many of these will be out-growths of developments born of war's necessities in which specialized refractories by Carborundum have played such an important part.

Take synthetic rubber for example. In certain processes "Carbofrax," with its high refractoriness, low spalling tendency and high thermal conductivity has helped to make higher production possible.

The unusual properties of "Carbofrax" are likewise utilized to excellent advantage in the manufacture of some of the materials required in synthetic rubber products to give them the desired characteristics.

In one method by which magnesium is produced, the highly corrosion resistant refractory "Monofrax" plays a vital role. Another magnesium process requires the use of "Carbofrax" because of its high strength at elevated temperatures and rapid heat conductivity.

In the production of zinc and molybdenum the unique properties of "Carbofrax" are again of tremendous importance in increasing output—reducing operating costs.

Thus, it is by no means surprising that we have our ears tuned to the plans for tomorrow—listening for word of new processes in which the use of Carborundum Brand Super-Refractories will undoubtedly prove of great value.

If your process—either present or planned—presents a refractory problem, we would welcome an opportunity of discussing it with you.

REFRACTORIES AND ELECTRO PRODUCTS
CARBORUNDUM

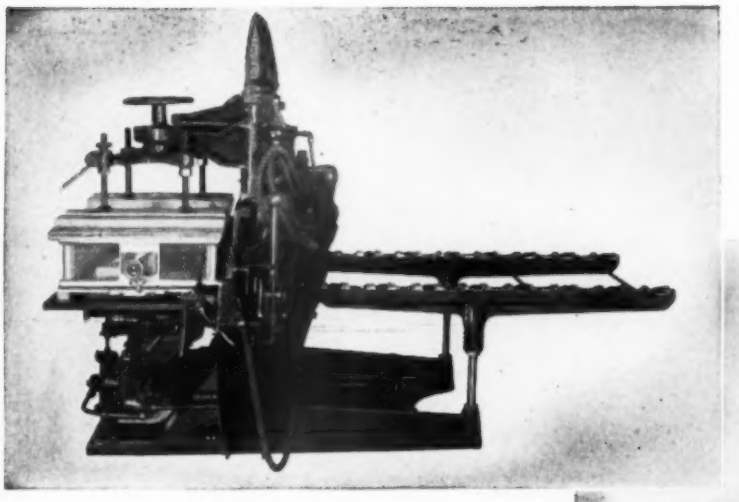
THE CARBORUNDUM COMPANY • PERTH AMBOY, N. J.

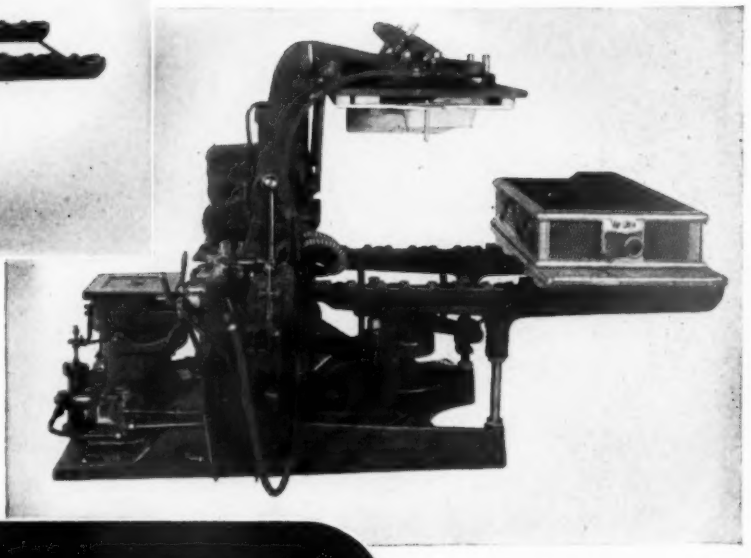
REG. U. S. PAT. OFF.

Refractory Division

District Sales Branches: Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh. Distributors: McConnell Sales and Engineering Corporation, Birmingham, Ala.; Christy Firebrick Company, St. Louis, Mo.; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Company, Los Angeles, San Francisco, Calif.; Denver Fire Clay Company, El Paso, Texas; Smith-Sharpe Company, Minneapolis, Minn.

(Carborundum, Carbofrax and Monofrax are registered trade-marks of and indicate manufacture by The Carborundum Company)





Above—View of No. 815 Jolt, Roll-Over Pattern Draw Machine Clamped, Equalized, and ready for Roll-Over Operation.

At Right—View of same Machine after Rolling Over, Showing Perfect Pattern Draw.

A FAST HIGH PRODUCTION JOLT, ROLL-OVER PATTERN DRAW MACHINE FURNISHED IN THREE SIZES

• Johnston-Jennings Jolt Roll-Over Pattern Draw Machines meet every requirement for fast, easy, efficient work. They assure maximum production even with relatively unskilled operators,—and are standard equipment in most large aluminum and magnesium foundries. These machines are built in three sizes and require no pits. They are of open end construction and incorporate many design and operating refinements much appreciated by practical operating men. Our fully descriptive catalog giving complete details of this and other Johnston & Jennings molding machines furnished gladly on request — No obligation — Send for a copy today.

A COMPLETE LINE PROVEN IN SERVICE INCLUDING—

PLAIN AIR JOLTS
in 12 different sizes

JOLT SQUEEZERS
fast sturdy machines—3 sizes

JOLT STRIPPING PLATES
4 sizes ranging up to 16" draw

JOLT, SQUEEZE, STRIPPING PLATE AND PATTERN DRAWS
Popular for medium service —2 sizes

PORTABLE JOLT ROLL-OVER AND PATTERN DRAW
A heavy duty thoroughly dependable machine—portable

JOLT ROLL-OVER AND PATTERN DRAWS
Fast large capacity machines with roll-out conveyors—4 sizes

Write for fully descriptive catalog giving complete specifications.

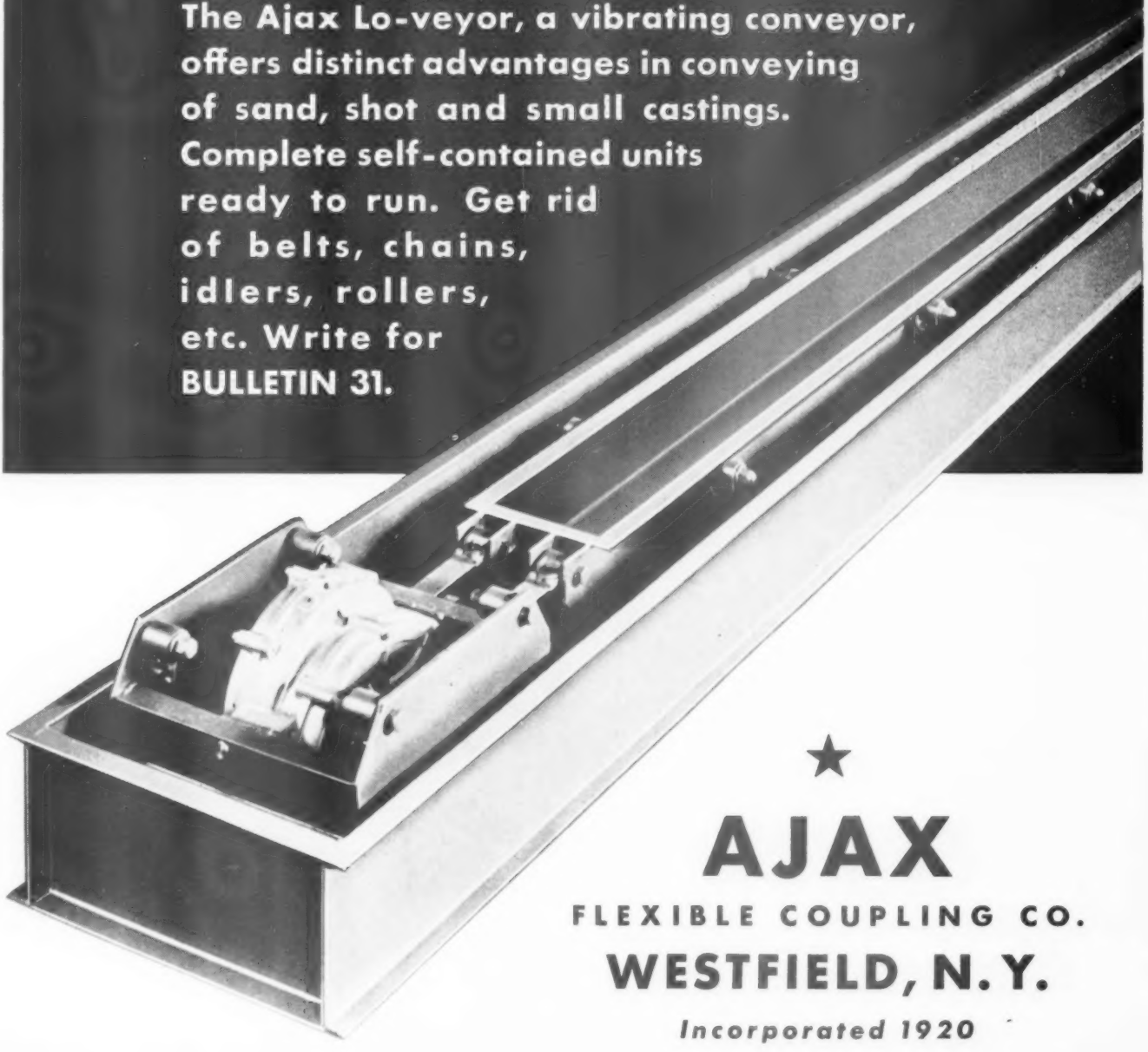
THE JOHNSTON & JENNINGS CO.

867 ADDISON ROAD • CLEVELAND, OHIO

AJAX

LO-VEYORS

The Ajax Lo-veyor, a vibrating conveyor, offers distinct advantages in conveying of sand, shot and small castings. Complete self-contained units ready to run. Get rid of belts, chains, idlers, rollers, etc. Write for **BULLETIN 31.**



★

AJAX

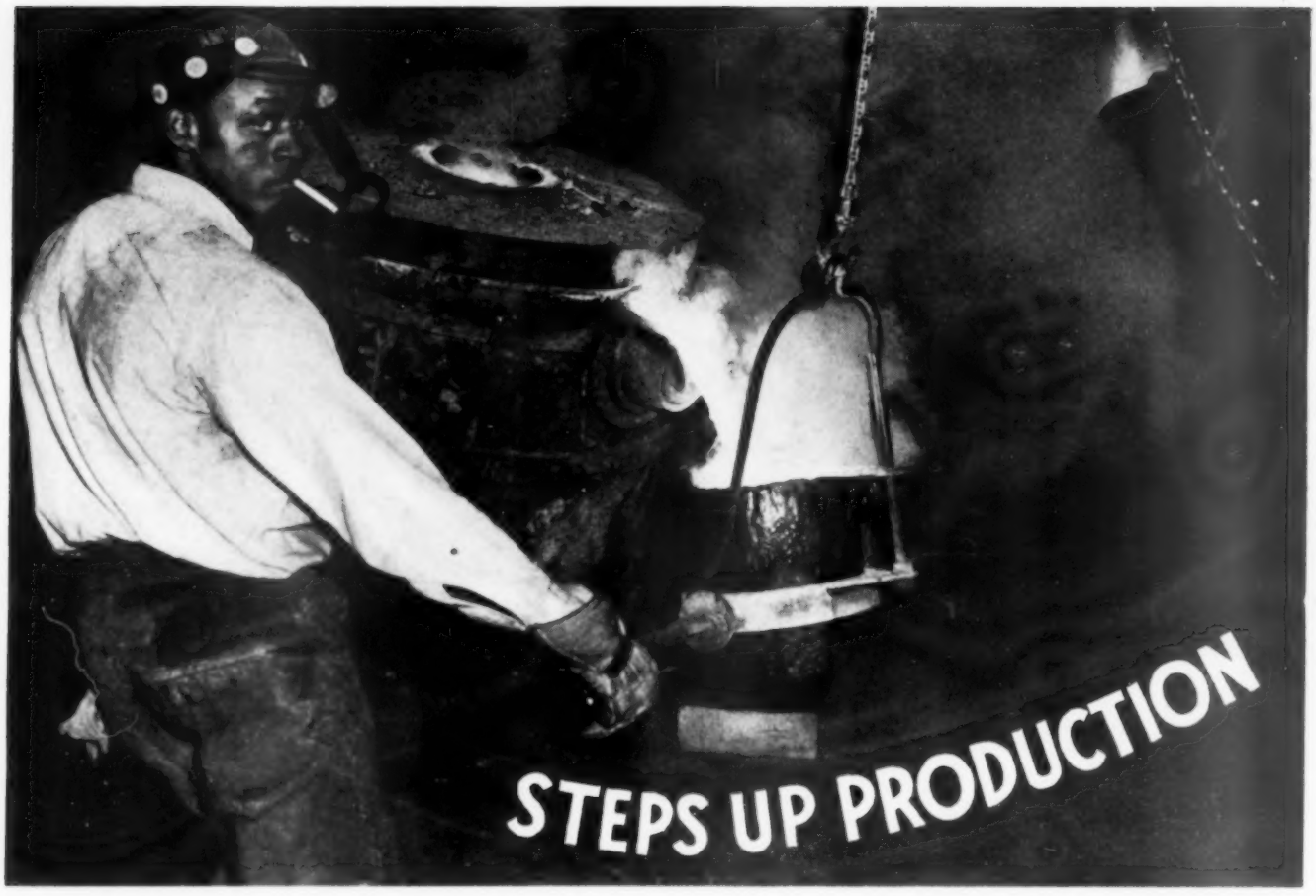
FLEXIBLE COUPLING CO.

WESTFIELD, N. Y.

Incorporated 1920

★

P. S. They are working good on ore, too.



SAFCO CORE OILS
for peak production

Production up 20% . . . up 30% and more!* Many reports like these are coming in from important war production plants who have tested Swan-Finch 'SAFCO' Core Oils.

As needs become *more* exacting . . . faster baking, less cleaning of core boxes, reduced core losses, fewer 'blows' and rejects, 'SAFCO' Core Oils become *more* in demand than ever.

The rapidly increasing use of 'SAFCO' Core Oils to meet increased production demands is due to our background of cumulative experience . . . over 30 years continuous research in formulating, developing and applying core oils.

Every day our field men are *proving* thru tests and recommendations that 'SAFCO' Core Oils can save time . . . *can increase production.*

It will pay you real dividends to get better acquainted with the Swan-Finch field representative who covers your district. Capable and able, they are constantly devising *new* ways and means for stepping up production.

For instance meet E. J. Lenz. He is one of our highly trained and experienced fieldmen. ASK US TO HAVE HIM CALL—NO OBLIGATION.

Reports in our files on core oil operations sent upon request.

SWAN-FINCH OIL CORPORATION

Offices		Plants	
New York City—Executive Offices	R.C.A. Building, West	Newark, N. J.	120 Lister Avenue
Chicago, Ill.	201 North Wells Street	Chicago, Ill.	5849 West 66th Street (Clearing, Ill.)
Detroit, Mich.	2596 Hart Avenue	Detroit, Mich.	2596 Hart Avenue

THESE 13 CLEARFIELD FEATURES...

. . . ALL CONTRIBUTE TO BETTER ALL-AROUND SAND PREPARATION

1. MIXING: the uniform distribution of sand grains, moisture and bond.
2. REDUCTION: the breaking down of lumps.
3. SIZE CONTROL: maintenance of grain size and structure.
4. TEMPERING: the working of moisture into the bond to develop strength and molding properties.
5. AERATION: the introduction of air into the sand mass, making it easy to ram in the mold and permeable for the escape of hot gases when the casting is poured.
6. FLOWABILITY: the quality of working smoothly against the pattern with uniform density.
7. CAPACITY: the production of the maximum quantity of well prepared sand in the least possible time.
8. BOND SAVING: making a given percentage of bond go as far as possible.
9. PRODUCTION of strong sand with minimum moisture additions.
10. ECONOMY: Minimum operating cost per ton of product, in labor, in power consumption and in repairs and upkeep.
11. CONVENIENCE in operation.
12. PROTECTION of workmen against health and accident hazards.
13. COOLING: the reduction of sand temperature.

Clearfield Mixers provide the ideal method in obtaining balanced mixing and tempering all types of molding sands.

Speed and efficiency are designed into every Clearfield unit. Continuous production shops report time cycles ranging from two minutes down as low as one minute. This spells tonnage!

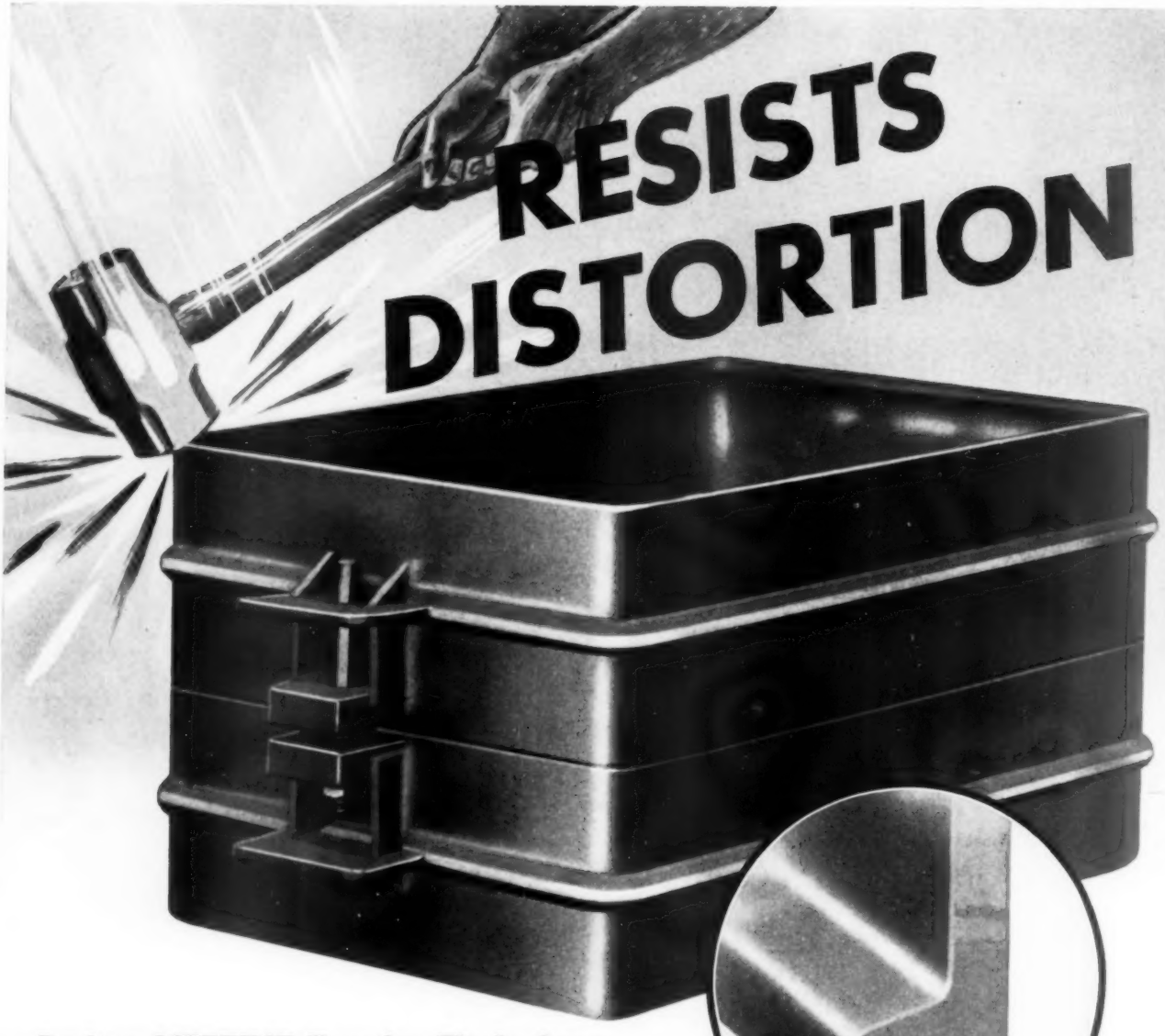
These machines are offered in batch capacities ranging from 4 to 40 cubic feet, meeting every practical foundry requirement.

WRITE FOR CLEARFIELD DATA. If a definite proposal is desired, state quantity, type of sand to be conditioned and characteristics of available electric current.

CLEARFIELD MACHINE COMPANY

CLEARFIELD
PENNSYLVANIA, U. S. A.

RESISTS DISTORTION



Sterling LIFETIME Foundry Flasks have the strength and rigidity to resist distortion and take hard, everyday punishment. The all-steel, all-welded flasks, with high carbon content, are fabricated into one solid, rigid piece. No wonder Sterling Flasks assure accuracy and speed in molding, even under tough, 3-shift production schedules. For complete foundry flask service — consult STERLING!

Unusually heavy flanges with square corners and full-width bearing. (Patent No. 1974292)

Sterling
FOUNDRY FLASKS
STERLING WHEELBARROW COMPANY • MILWAUKEE, WIS., U. S. A.

A 4149-1P

VOLCLAY BENTONITE

NEWS LETTER No. 5

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE

SUBSTITUTE FOR CEREAL BINDERS!

Panther Creek Bentonite is an acceptable emergency substitute for the cereal binders used in core and molding sand practice.

It is not rationed, requires no priorities, the supply is ample, deliveries are immediate – and it COSTS LESS.

It does not fill all the requirements of cereal, but can be used as a partial replacement in many cases and as a full substitute in some.

Panther Creek supplies much more green strength than cereal, its sintering point is higher, it does not create gas, and does not migrate to the surface of cores.

It does not give mold skin hardness like cereal; that is its only serious disadvantage. Its dry strength is lower than cereal, but if dry strength is needed, Volclay Western Bentonite will give plenty.

Its fired strength is higher, that is, it retains its strength WHILE HOT better than cereal but has the desirable effect of breaking down completely after cooling from exposure to over 1100 deg. Fahr. See our Bulletin 223-C – "Heat Penetration into Foundry Molds."

Combinations of bentonite and cereal have had long and successful use in foundry practice. It now appears that the "collapsible" qualities of Panther Creek Bentonite qualify it to be used more extensively as a substitute.

Panther Creek is being successfully used in large green sand cores for steel molding, in baked oil sand cores of many kinds, and as an auxiliary ingredient to insure collapsibility in dry sand molds.

Write for our 12-page Panther Creek Booklet!

Produced by

AMERICAN COLLOID COMPANY

363 WEST SUPERIOR STREET • CHICAGO, ILLINOIS

SPEED RISER CUTTING

Save Manpower—*Save* Grinding

Cutting risers with an Airco Radiagraph gas cutting machine saves time, eliminates grinding—and is so simple that women can be quickly trained to handle the job.

For example, the riser on this casting made by Maynard Electric Steel Castings Co., Milwaukee, Wisconsin, was machine gas cut so cleanly that absolutely no grinding was required. Measuring 5" thick, the riser was cut at a linear speed of 6" per minute with an Airco Radiagraph. This also permitted cutting the riser within 1/2" of final dimensions, thus saving considerable machining. In fact, had not a 1/2" padding been required by certain specifications, the riser could have been cut even closer.

Here is an actual "case history" demonstration that machine gas cutting of gates and risers speeds production and saves materials and cost. For further details, call or write your nearest Air Reduction office.

Note the exceptionally clean-cut appearance of these gear castings. Machine gas cutting assures uniformly good results and brings savings in time and cutting cost.

Air Reduction

Buy United States War Bonds

General Offices: 60 EAST 42nd ST., NEW YORK 17, N. Y.

IN TEXAS: MAGNOLIA-AIRCO GAS PRODUCTS CO.

General Offices: HOUSTON, TEXAS

AIRCO

WILSON

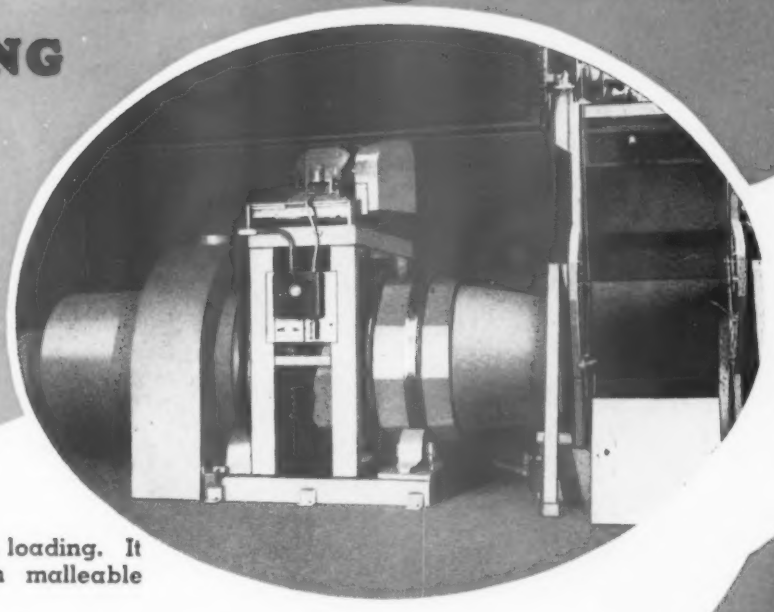
IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

Ransohoff

Automatic Star Return

WET CLEANING MILLS

Just the Cleaning Mill for the job shop

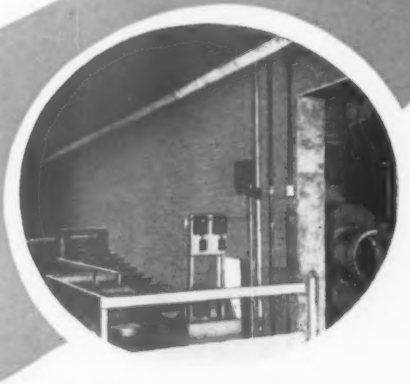


THE Ransohoff Cleaning Mill illustrated is a 60" x 72" End-Loading, End-Unloading Automatic Star Return WET Cleaning Mill installed in a malleable job shop in Michigan. The power loader sets in a pit below floor level for ease in loading. It cleans miscellaneous hard iron malleable castings.

NOTE THE SPEED OF THE COMPLETE CYCLE

3,000 lb. batch is loaded, cleaned and unloaded in

10 MINUTES FROM START TO FINISH



For convenience, the sand conveyor has been placed on the other side of the wall from the cleaning mill.

WHY THE RANSOHOFF WET METHOD IS SO SUCCESSFUL AND PRACTICAL:

Castings cascade in a mass in which stars are intermingled thoroughly. All voids are filled completely with various sized and shaped stars, which enter and return automatically. Very rapid cleaning results without nicking, breaking or excessive wear on mill lining. No need of dust collectors. Health hazards are reduced.

Write the Ransohoff Engineers for details.

N. RANSOHOFF INC

Township & Big 4 R. R. CINCINNATI, OHIO

THE EXECUTIVE WHO STOPS TO THINK . . .

Knows that "10% for War Bonds isn't enough these days"

Workers' Living Costs going up . . . and Income and Victory Tax now deducted at source for thousands of workers . . .

Check! You're perfectly right . . . but all these burdens are more than balanced by *much higher* FAMILY INCOMES *for most of your workers!*

Millions of new workers have entered the picture. Millions of women who never worked before. Millions of others who never began to earn what they are getting today!

A 10% Pay-Roll Allotment for War Bonds from the wages of the family bread-winner is one thing—*a 10% Pay-Roll Allotment from each of several workers in the same family is quite another matter!* Why, in many such cases, it could well be jacked up to 30%—50% or even more of the family's *new* money!

That's why the Treasury Department now urges you to revise your War Bond *thinking*—and your War Bond *selling*—on the basis of *family* incomes. The current War Bond campaign is built around the family unit—and labor-management sales programs should be revised accordingly.

For details get in touch with your local War Savings Staff which will supply you with all necessary material for the proper presentation of the new plan.

Last year's bonds got us started—*this year's bonds are to win!* So let's all raise our sights, and get going. If we all pull together, we'll put it over with a bang!

This space is a contribution to America's all-out war effort by

THE FOUNDRY—

you've done your bit
. . . now do your best!

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Large volume –

unexcelled scientific equipment –

and wide experience covering 50 years –

have established this Company as a main source

for non-ferrous alloy ingot

from scrap metals

How it all starts . . . . . .

BUY
WAR
BONDS

Michigan Smelting
and Refining

Division of BOHN ALUMINUM & BRASS CORPORATION, Detroit, Michigan

General Offices - Lafayette Building

GLOVES, HANDPADS AND MITTENS

made by AO for Foundrymen

Shown above are four important items needed by many of your workmen—to protect their hands and forearms. AO offers a complete line of protective gloves, mittens, and handpads, in all standard styles and lengths.

No. 1644 Reinforced Steel-Stapled Gloves

These reinforced, gauntlet-style gloves are especially recommended for workers who handle castings, sheet steel, and plates. The entire working area of these gloves is reinforced with heavy strips of tough leather, studded with steel stitches. The thumb has a special reinforcing patch.

No. 1514 Reinforced Asbestos Gloves

These gauntlet-style, asbestos gloves are recommended for operators who work in heat treating departments, and for those who have to handle hot materials. The palm and working side of the thumb are reinforced with chrome tanned leather —to provide added protection and extra wear. The gloves are double-stitched for double strength.

No. 1202 Reinforced Handpads

Made of chrome tanned leather, reinforced with a steel-studded patch covering the entire working area, these pads are recommended for operators on jobs where protection to the back of the hand is not a problem. They can be worn on jobs where gloves or mittens would seem too hot or cumbersome.

No. 1678 Reversible Mittens

Made of chrome tanned leather, these mittens are recommended for handling rough or jagged materials. They are reversible for extra life. All seams are steel stitched.

Your AO Safety Representative will gladly show you these items as well as leggings, spats and other safety equipment needed for an efficient and economical head-to-ankle protection program.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

Manufacturers for 110 years of products to aid and protect vision. Branches in all principal industrial centers

Federated Bearing Alloy is used in the Jeep

Federated's *new lead-base* bearing alloys — like the Jeep — are masters of many climes. From the tropic heat of the jungle to the numbing cold of near-polar areas, these bearing alloys have stood the gruelling tests of mechanized warfare.

Federated's *new lead-base* bearing alloys are not solely emergency substitutes to conserve tin, but are products assured of permanent recognition and acceptance. They are highly stable, easily applied and lubricated, resist fatigue at high temperatures, cost 75% less than *tin-base* alloys but with comparable properties and are readily available without priority.

Consulting service available through your nearest Federated office.

PRODUCTS PRODUCED BY FEDERATED METALS

ALUMINUM	SOLDER
BRASS	BABBITT
BRONZE	TYPE METAL
DIE CAST ALLOYS	ZINC DUST

All of these in all commercial forms — Special Alloys to your specifications.

FMD

Federated

METALS DIVISION

AMERICAN SMELTING and REFINING COMPANY

120 BROADWAY, NEW YORK (5) N. Y.

SALES OFFICES
ATLANTA, GA.
BALTIMORE, MD.
BIRMINGHAM, ALA.
BOSTON, MASS.
CINCINNATI, OHIO
CLEVELAND, OHIO
DALLAS, TEXAS
DENVER, COLO.
DETROIT, MICH.
LOS ANGELES, CAL.
MILWAUKEE, WIS.
MINNEAPOLIS, MINN.
NEW ORLEANS, LA.
NEW YORK CITY
PHILADELPHIA, PA.
PITTSBURGH, PA.
PORTLAND, ORE.
ROCHESTER, N. Y.
SALT LAKE CITY, UTAH
ST. LOUIS, MO.
SAN FRANCISCO, CAL.
SEATTLE, WASH.
WHITING, IND. (Chicago)
PLANTS
BECKMEYER, ILL.
DETROIT, MICH.
HOUSTON, TEXAS
LOS ANGELES, CAL.
NEWARK, N. J.
PERTH AMBOY, N. J.
PITTSBURGH, PA.
SAN FRANCISCO, CAL.
ST. LOUIS, MO.
TRENTON, N. J.

IF YOU'RE MAKING MORE MONEY

...WATCH OUT!

WE WANT TO WARN YOU, before you read this page, that you've got to use your head to understand it.

We also want to warn you that—if you don't bother to read it carefully enough to understand it—you may wake up after this war as poor as a church mouse.

• • •

This year Americans are going to make—minus taxes—125 billion dollars.

But this year, we civilians are not going to have 125 billion dollars' worth of goods to spend this on. We're only going to have 80 billion dollars' worth. The rest of our goods are being used to fight the war.

That leaves 45 billion dollars' worth of money burning in our jeans.

Well, we can do 2 things with this 45 billion dollars. One will make us all poor after the war. The other way will make us decently prosperous.

This way the 45 billion dollars will make us poor

If each of us should take his share of this 45 billion dollars (which averages approximately $330 per person) and hustle out to buy all he could with it—what would happen is what happens at an auction where every farmer there wants a horse that's up for sale.

If we tried to buy all we wanted, we would bid the prices of things up and up and up. Instead of paying $10 for a dress we're going to pay $15. Instead of $5 for a pair of shoes we're going to pay $8.

This bidding for scarce goods is going to raise prices faster than wages. Wages just won't keep up.

So what will people do?

U. S. workers will ask for more money. Since labor is scarce, a lot of them will get it. Then farmers and business men who

feel the pinch are going to ask more money for their goods.

And prices will go *still higher*. And the majority of us will be in that same old spot again—only worse.

This is what is known as Inflation.

Our government is doing a lot of things to keep prices down . . . rationing the scarcest goods, putting ceiling prices on things, stabilizing wages, increasing taxes.

But the government can't do the *whole job*. So let's see what *we* can do about it.

This way the 45 billion dollars will make us prosperous

If, instead of running out with our extra dough, and trying to bid on everything in sight, we buy only what we absolutely need, we will come out all right.

If, for instance, we put this money into (1) Taxes; (2) War Bonds; (3) Paying off old debts; (4) Life Insurance; and (5) The Bank, we don't bid up the prices of goods at all. And if besides doing this we (6) refuse to pay more than the ceiling prices; and (7) ask no more for what we have to sell—no more in wages, no more for goods—*prices stay where they are now.*

And we pile up a bank account. We have our family protected in case we die. We have War Bonds that'll make the down payment on a new house after the war, or help us retire some day. And we don't have taxes after the war that practically strangle us.

Maybe, doing this sounds as if it isn't fun. But being shot at up at the front isn't fun, either. You have a duty to those soldiers as well as to yourself. You *can't* let the money that's burning a hole in your pocket start setting the country on fire.

★ ★ ★

This advertisement, prepared by the War Advertising Council, is contributed by this Magazine in co-operation with the Magazine Publishers of America.

KEEP PRICES DOWN!

Use it up
Wear it out
Make it do
Or do without

★ Just a little more than one year ago we were awarded the Navy "E" Burgee as a result of the tireless effort of "AUTOMATIC" employees in the continued production of equipment essential to the war effort.

Our organization, loyal to the core, has kept up the pace set when Uncle Sam first called for all out production.

So now, for the third time "AUTOMATIC" employees have won the Navy Production Award for meritorious service on the industrial field of battle.

The SECOND SILVER STAR has been placed on the Navy "E" Burgee we so proudly fly.

We'll keep it up—that is the spirit that prevails at "AUTOMATIC." Here we are all dedicated to the task of producing more and producing on time.

MANUFACTURERS FOR OVER 35 YEARS *Electric Propelled* INDUSTRIAL TRUCKS

AUTOMATIC TRANSPORTATION CO.

121 WEST 87th STREET — DIV. OF THE YALE & TOWNE MFG. CO — CHICAGO, ILLINOIS

One Piece Forged Tool Steel

Moulders Tools

No. 1
SLICK & OVAL SPOON

Width	¾"	1"	1¼"	1½"
Each	$1.05	$1.15	$1.40	$1.55

No. 5
OVAL SPOON & TAPER SLICK

Width	¾"
Each	$1.15

No. 10
TAPER & SQUARE

Width	¾" Taper, ½" Square
Each	$1.15

No. 15
BENCH LIFTER

Width	¼"	½"	¾"
Each	$1.05	$1.15	$1.40

No. 40
STRAIGHT LIFTERS

Length	10"	12"	14"	16"	18"
Width—¼"	$1.05	$1.15	$1.20	$1.30	....
⅜"	1.05	1.15	1.20	1.30	....
½"	....	1.30	1.35	1.40	$1.55
¾"	....	1.40	1.50	1.60	1.75

Special Lifter, ½" wide x 24" long — $2.50

MOULDERS VENTING TOOL
For Steel and Semi-Steel Foundries.

Length	16"
Width—⅜"	$1.20
½"	1.35
¾"	1.50

ROUND FINISHING TROWEL

	6" long	7" long
Width—1½"	$1.80	$1.85
2"	....	1.90

SQUARE TROWEL

Width—1½" x 7"	$1.85
2" x 7"	1.90

Prices subject to change without notice. This is our complete line of tools. New tools will be added to this list when justified by demand. DELIVERY MADE IMMEDIATELY FROM STOCK.

THE FREEMAN SUPPLY COMPANY

PATTERN SHOP AND FOUNDRY SUPPLIES AND EQUIPMENT

TOLEDO, OHIO

War Has Developed Many Foundry Problems Which Need Study and Research

PURPOSES, aims and work of the War Metallurgy Committee of the National Academy of Sciences and the National Research Council recently were reported as follows: To provide advisory reports on metals and minerals for the War Production Board, the National Defense Research Committee, and other war organizations, covering the problems of production, conservation and substitution; to organize and supervise specific researches on metallurgical problems relating to production, conservation and substitution for the War Production Board, and relating to instrumentalities and materials of war for the Office of Scientific Research and Development; and to collect and distribute to the armed services metallurgical information that is made available through war research of industry, government agencies, and research and experience of our allies.

In serving in an advisory capacity on metallurgical problems to the War Production Board, the War Metallurgical Committee is directing a number of research projects concerned with the production and use of metals in the war effort. These projects are sponsored by the WPB, and in the majority of cases they are not initiated by the committee. Usually the committee functions in the capacity of an appraiser of the metallurgical problems which have been submitted to it for consideration by the interested divisions of the WPB, or by industry itself. The committee makes every effort to collect all available information pertaining to the specific problems. If the data thus developed are not sufficient to meet the needs of the particular problem, and research appears necessary to secure additional or missing information, the committee can recommend the establishment of a research project on the subject at a suitable laboratory.

Thus far the foundry industry has not taken full advantage of the excellent facilities offered by the War Metallurgy Committee for the study of foundry problems. Ever since the early days of the Council of National Defense, which was succeeded by the OPM and the WPB, all foundries, but particularly those producing gray iron, malleable iron and certain nonferrous castings, have been concerned with converting their products to war applications. Over a period of years, these foundries had made remarkable progress in products and practices. The executive personnel had developed the technique of producing excellent castings, which were used widely as engineering materials. But with all of this knowledge in the ramifications of foundry practices, and with excellent products possessing splendid physical properties, the problems of conversion to war work have been most difficult, and the progress in that direction has been slow and often most discouraging. Perhaps more assistance might have been secured from the War Metallurgy Committee.

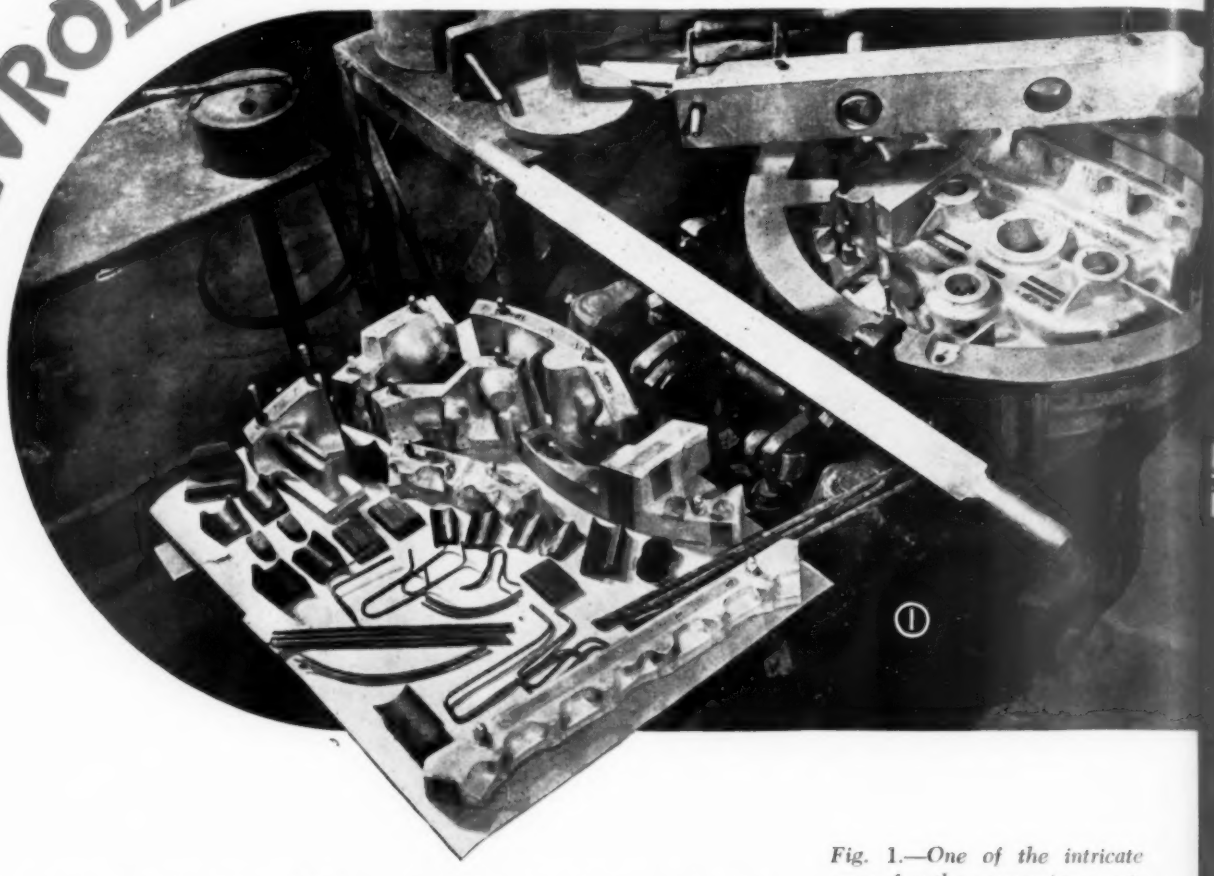
While the situation has improved greatly in recent months, not all of the problems which concern the application of castings to the war effort have been solved. Much remains to be done in applying castings to the production of war materiel, or in the substitution of castings for other products which cannot be provided in sufficient volume to meet schedules. At the same time, ever changing war demands and shortages of materials have brought about new production problems. If these problems were to be presented to the War Metallurgy Committee in light of their influence on war production, many studies possibly could be undertaken by that organization. The record shows that numerous problems of other industries have been and are being studied by the committee, and therefore, it seems reasonable to assume that the group would be glad to have an opportunity of investigating any technical problems of the foundry industry that have a bearing on the war effort.

What organizations should approach the committee with problems pertaining to castings and the war effort? Based entirely on the accepted division of functions, the American Foundrymen's Association should handle those problems which have to do with practices and the development of products possessing particular physical properties, and the trade associations should propose those problems pertaining to product application. If the line of demarcation is indistinct, a joint effort could be undertaken in bringing the problem to the committee.

Industry is beginning to give considerable thought to postwar planning. In any study that foundrymen may make on that subject, they will realize that progress made during the war in the further improvement of practice and product will provide the most effective ammunition for meeting the competitive era that must come with the peace. Therefore, in utilizing to the fullest extent those agencies related to the government which have been established to conduct studies and research on technical problems, the foundry industry not only will be functioning more effectively in its No. 1 job of helping to win the war, but also will be doing an excellent job of postwar planning.

Frank G. Steinebach
Editor

CHEVROLET CASTS MAGNESIUM



TO WHAT in peacetime was the world's largest gray iron foundry supplying the castings basic to its million-car production years, Chevrolet Gray Iron Foundry Division, General Motors Corp., Saginaw, Mich., has added a magnesium foundry which is expanding toward an output that will rank with the largest in the nation. Currently pouring at the rate of thousands of pounds per 16-hour day, the plant eventually will triple its present daily rate.

At a steadily accelerating pace, magnesium castings flow from this foundry to the Chevrolet processing and assembly plants throughout the nation which are producing Pratt & Whitney aircraft engines in volume. Eight different castings are produced, including the oil drain sump, supercharger insert, impeller diffuser, two intermediate crankcases, two rear crankcases, and the blower crankcase section. Some notion of the complex structure of the castings poured may be gained from the fact that 88 individual cores are required to produce the eight castings, two of which take 25 cores each.

Bringing mass production foundry techniques to the magnesium field—one more closely associated with chemistry than with metallurgy heretofore—Chevrolet has developed several new approaches certain to be reflected in increased output or in time-saving. Unique in the industry, according to J. F. Miller, plant manager, is the practice of pouring magnesium on a conveyor. Pouring on the conveyor was started on an experimental basis on Dec. 15, 1942. Production pouring began Jan. 15, 1943.

Of special interest is the fact that no drag mold is used for casting the rear crankcase, thus permitting greater accuracy and a cleaner job. This is accomplished by assembling 25 cores on a plate. These cores are dried after assembling and pasting. The assembly then is delivered to the molding conveyor. The cope mold is closed over the assembly and the mold poured. Special equipment was designed to make possible production on this basis. Another departure from general magnesium procedure is pouring the metal through sand strainer gates rather than through a metal screen, or through no filter whatsoever.

Three buildings virtually were denuded of equipment to prepare for the new opera-

Fig. 1.—One of the intricate cores for the magnesium castings requires 7 sections, 17 chills and 20 wires for its production. The illustration shows the main core box, loose pieces, chills and reinforcing wires. As may be expected considerable skill is required to place the various parts in their proper locations. Fig. 2—Completed core made in the core box shown in Fig. 1—Here one operator is removing the various loose pieces while the other operator replaces them in the box. Fig. 3—Here the operator just has removed the cope section of a core box for a saddle core. Fig. 4—In the case of the "under front" core, the core box is rolled over, and the core is drawn away from the box. Fig. 5—Some cores are made by hand, and this view shows at the left the operator tucking the sand in the box while the completed core appears at the right. Fig. 6—Another view of the core box shown in Fig. 1. Fig. 7—Checking completed cores on a core rack

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tion as a Defense Plant Corp. project. About 65 per cent of the machinery was moved out and extensive alterations were made.

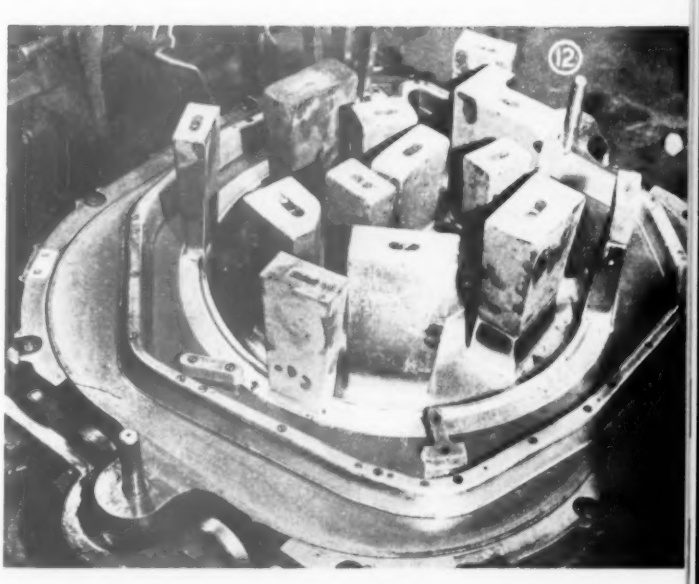
The foremen began 2 to 3 months in advance to learn magnesium. One of the first things they learned was the fact you cannot turn your back on a Jap or a pot of magnesium. Accustomed to working in gray iron the employes have had to learn new techniques to master the new material. Once supervision had been trained on a pilot output, line men were hand-picked for instruction. With one man assigned to a foreman, they were schooled thoroughly. Today, new employes are taught in the same careful manner.

The magnesium alloy, containing 6 per cent aluminum, 3 per cent zinc and 0.15 per cent manganese, is obtained in 21-pound ingots. The alloy is melted at 1250 degrees Fahr. in 2000-pound pots, then superheated and refined between 1650 and 1700 degrees in 400-pound pots. The molten magnesium is cooled to around 1450 degrees for pouring. Each casting is poured within a predetermined 20-degree range. Accurate heat control is exercised by placing a thermocouple in the ladle to obtain the temperature reading. Molds are arranged on the conveyor in heat succession, those requiring pouring at the higher temperature passing first. The metal is brought to the conveyor line on overhead rails.

The inhibitor used in the core sand is sulphur and boric acid. The inhibitor dust shaken into the ladle while pouring or in transit is sulphur, ammonium fluoride, and boric acid. Flux is added during melting and superheating to refine and protect the metal from oxidation and burning.

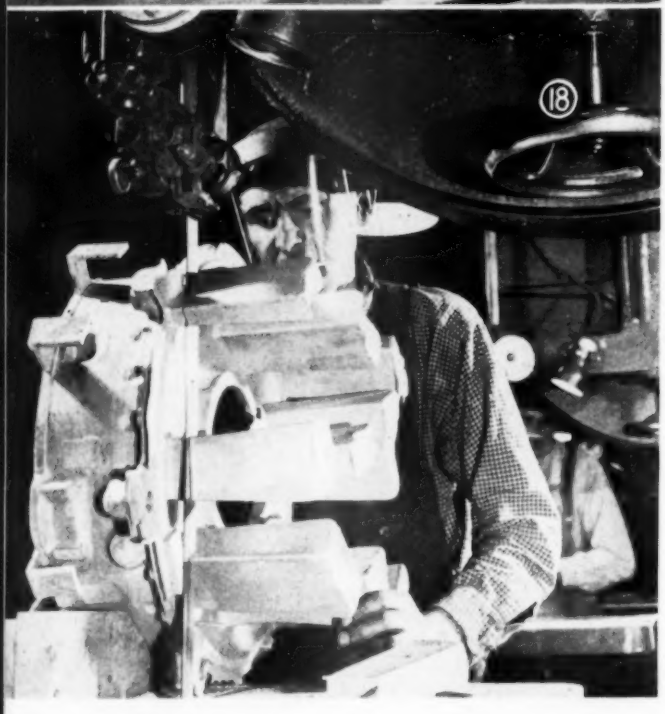
After casting, cores are knocked out on a specially developed knockout machine. Using an air-pressure vibrator, the machine is hooded in an enclosure to reduce noise and dust. A sandblast machine removes the re-

Fig. 8—Fitting core into recess in body core. Fig. 9—Cores being trucked into oven for baking. Fig. 10—Placing body core into mold. Fig. 11—Setting right front bearing core. Fig. 12—Cope half of pattern. Fig. 13—High-heat magnesium melting pots. Fig. 14—Pouring magnesium castings as molds move on conveyor. Fig. 15—Removing casting from mold. Fig. 16—Core and molding sand shakeout machine



maining sand. After knockout and sandblast, gates and risers are sawed off. The castings then are acid-dipped, water-rinsed, dipped in a dichromate solution, rough machined, and are solution heat treated and precipitation heat-treated. Castings then are pressure-tested for leaks at the high oil pressure to which the finished parts will be subject. Magnesium casting scrap is reworked, as are chips and shavings. Dust is burned, since reworking is hazardous and impractical.

Though rough machining only is done in the plant, another special feature has been worked out in that respect. Instead of employing a chipping hammer to knock off risers, milling machines are used after risers have been sawed off, assuring a cleaner, finished job and avoid-



ing any scratching and nicking of the castings.

An integrated, continuous sand system is employed at the foundry, using synthetic sand. Every 2 hours, rigid tests are applied, to control permeability, moisture, strength, and inhibitors.

In contrasting magnesium and gray iron practice, Chevrolet officials term the entire operation of magnesium casting as "jobbing work on a production basis." In magnesium the foundry pours about three times as much metal as it obtains in the form of finished castings—due to the number of risers for adequate feeding—whereas in gray iron this excess represents only 25 to 27 per cent of the finished casting weight.

Other significant differences between the handling of the two metals include the use of numerous chills in cores and molds, because of the greater need of directional solidification; more hand labor time, more skill required; much greater fire and explosion hazard; far more extensive heat treatment required; infinitely more supervision, clerical and metallurgical work necessary (due not only to the nature of magnesium but also to the exacting standards established for aircraft construction), and a lower accident and absentee rate. Fewer accidents have been encountered because the men are working with a new and unfamiliar metal for which they have the highest respect. Less absenteeism is experienced because the workers feel more closely allied with the war effort.

Approximately 40 women are now employed at the Chevrolet foundry on magnesium burring exclusively. Eventually doubling of that figure is a possibility. Some 75 will be employed on cleaning and core assembly.

Peak production will find two lines in operation; one is running currently. The number of melting pots will be increased; number of superheat pots nearly doubled.

While usual safety precautions are taken at the Chevrolet plant, of interest is the fact (*Please turn to page* 179)

Fig. 17—*Inspecting and marking rough castings. Fig.* 18—*Sawing off casting risers. Fig.* 19—*Acid and dichromate dipping precedes rough machining and heat treating*

NONFERROUS FOUNDRIES NEED Temperature Control

By D. FRANK O'CONNOR
Nonferrous Foundry Superintendent
Walworth Co., Greensburg, Pa.

BECAUSE of restrictions on strategic material, manufacturers of nonferrous pressure castings are faced today with the problem of furnishing castings made from available metal to withstand internal pressures at normal and elevated temperatures. Kind of alloy or metal to be used depends on service required. Many liquids, steam, gas, air, etc., flow through these castings. They should be safe and sound.

High quality standards, a distinct aid to the industry, have been established by Navy and Ordnance departments and by consumers. Close surface inspection and minimum tolerance for machine finish have forced the foundryman to establish better control of foundry practice. Each foundry has its own economic problems. Size, location, equipment and production determine the practices and methods set up to get the best possible results under existing conditions. In a production foundry where castings of similar nature are made, definite control must and can be maintained.

In the foundry with which the writer is connected, the problem includes many mixtures which must be produced to meet specifications of the metallurgists or engineers in charge of the many industries which use the foundry's product. Through co-operation of the metallurgist and foundry foreman, standard practices are set up. Ultimate result must be sound pressure tight castings that must be produced with the equipment at hand.

Many factors enter into the production of good sound castings. Experience is most valuable in establishing practices in coremaking, melting, molding, gating, pouring, and metal temperature control to insure a maximum yield of good castings. Atmospheric conditions also are considered in foundry practice. Maximum results cannot be obtained without proper coordination of all these factors.

One of the most important is the pouring temperature. Without knowledge of the pouring temperature, proper control of foundry practice cannot be established.

Physical properties of an alloy are no better than the material used. Usually metals are purchased in ingot form to rigid specifications. The first and one of the most important items in foundry practice is melting. Regardless of the type of furnace the metal must be melted as quickly as possible and to between 50 and 100 degrees higher than required for pouring metal into molds.

Pouring temperature is a guiding factor in melting practice. Here is where metal temperature should get its first and most important reading. Experience shows that more accurate reading results are obtained from a pyrometer installed against something rigid, for example on a wall, where it would be safe from damage by striking or handling. However, with proper care, portable pyrometers can be used with a good deal of accuracy. Sensitiveness of the thermocouple to the portable pyrometer is very important and affects the reading, if the connecting points are not well cleaned for proper contact. The thermocouple should be kept free from foreign materials.

Instruments suitable for all practical purposes can be purchased and are highly recommended to establish temperature control for both melting and pouring. The day has gone for judging the metal by eye. The old time foundryman can make a good guess, but pouring temperature today means much more than formerly. Conservation of metal has forced the foundryman to produce castings from new alloys or alloys that cannot be familiar to the eye for proper pouring temperature. Therefore, it is necessary to consider seriously the correct temperature at which metal should be poured to produce a casting that will be sound under high pressure testing. Also, quick solidification will produce finer grain metal.

In recommending practice to control pouring temperature for pressure casting several factors including the following must be considered: Design of casting, number of molds and number of castings to be poured in a mold; gating, heading and risering; preheating of ladles; sand control, strength, permeability and moisture; method of pouring, equipment for handling; pouring range.

During these days of war production, forged or rolled material is too difficult to procure. Castings must be used. Casting design is still a serious foundry problem. The foundryman must accept the job of furnishing castings of intricate design and apply the best practice possible to get maximum results. The greater the number of castings in a mold the more serious the problem.

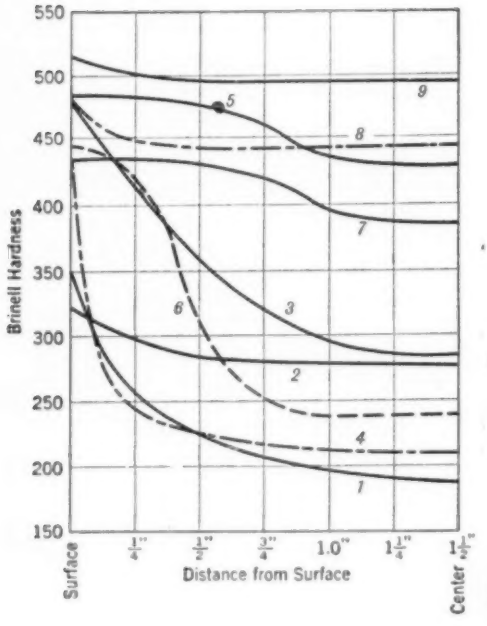
Gating, heading and the proper location of risers is determined best by experience. If we keep in mind that the metal must solidify quickly we will not gate, head or apply risers that are too large. However, they must be large enough to feed the casting and insure that the metal is of good grain structure when solid.

Good results have been obtained in pouring red brasses and bronze alloys between 2100 and 2300 degrees Fahr. It is common among foundrymen to play safe, gate heavy, and apply large risers to insure (*Please turn to page* 174)

A talk presented during the annual meeting of the American Foundrymen's Association held in St. Louis April 28 to 30

Progress in f

By J. S. VANICK
Metallurgist
International Nickel Co.
New York



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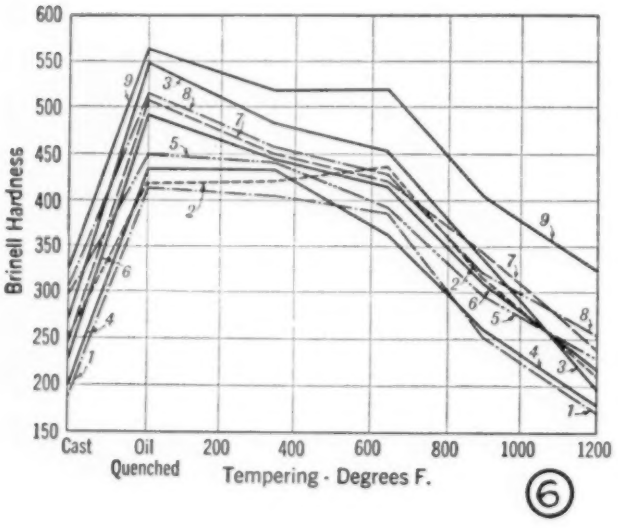

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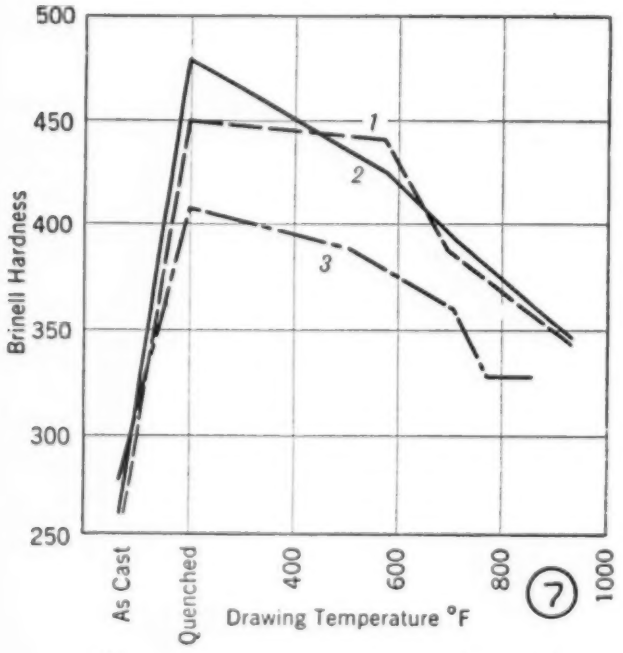

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No.	1	2	3
Total Carbon	3.36	3.35	3.39
Silicon	2.30	2.07	2.09
Nickel	1.32	2.56	3.37
Chromium	0.44	0.95	0.61
Quenching medium	Oil	Oil	Air

A HARDNESS increase of 150 to 300 brinell units is obtainable by heat treatment, and the higher value usually accompanies the cast iron which was initially harder in the "as cast" condition. Thus, in Fig. 6, Coyle[4] shows the better hardening response occurring in the alloy-hardened, low-silicon or low-carbon types of iron described in Table V. The quenching temperatures used on most irons in production at the present time are from 1450 to 1600 degrees Fahrenheit. The quenching medium most commonly used is oil, although water or air are also used to a limited extent.

Composition of the material is governed largely by requirements of machinability in the "as cast" condition and toughness to resist cracking during quenching. Castings may be annealed completely or partially and softened for machining before hardening them, without appreciably affecting the subsequent response to hardening treatments. This is due to the very rapid re-absorption of graphite into solution at temperatures above the critical. The higher the temperature, the greater the amount of carbon in solution at the quench, the higher are the hardnesses obtainable. Castings to be hardened usually are rough-machined before hardening and tempering and are finished by grinding. A small amount of distortion occurs on quenching, and allowance must be made for this in leaving stock for finish grinding. Where strength properties and shock resistance are not of particular importance, the tempering operation may be omitted.

Some data[5] on the wear resistance of hardened cylinder liners used in heavy duty internal combustion engines are available which indicate that hardening increases wear resistance from two to seven times as compared to the wear resistance in the "as cast" condition.

With some compositions, the castings may be quenched in an air blast or still air and the desired hardness secured. (See air hardening which follows later). Alloys are known to retard the progress of transformations on cooling, so that the presence of them may produce a hardening re-

This is the second and concluding article taken from a paper presented at the Sixth Annual Foundry Conference held by the Wisconsin Chapter of the A.F.A. at Milwaukee on Feb. 18 and 19. The first article appeared in the July issue.

Fig. 5—Hardness from surface to center of 3-inch diameter bars quenched in oil from 50 degrees Fahr. above the critical range. Compositions are shown in Table V. Fig. 6—Effect of quench and drawback on brinell hardness of compositions given in Table V. Fig. 7—Effect of quench and drawback on brinell hardness of nickel-chromium cast iron piston rings according to Hurst

Heat Treatment

OF ALLOY CAST IRON

sult by air cooling, that is similar to the effect produced in oil or water quenching. For castings of complicated shape it becomes desirable to apply the milder quenching conditions to avoid cracking or excessive distortion. Experiments have shown that nickel, manganese, chromium and molybdenum in appropriate amounts reduce the rate of transformation so that the end structure after cooling in the mold or in the air, will approach the structures produced in unalloyed iron by oil or water quenching (See Fig. 7).

Heavy-sectioned castings, such as are represented by large dies and machine tool (*Please turn to page* 176)

Table V—Plain and Alloy Heat-Treated Cast Irons

Number	Total Carbon	Manganese	Silicon	Nickel	Chromium	Quenching Temp. °F	Quenching Temp. °C
1	3.37	0.58	1.49	.	.	1550	847
2	2.79	0.74	2.58	.	.	1575	857
3	2.54	0.76	2.51	1.05	.	1575	857
4	3.15	0.54	1.23	0.97	.	1525	830
5	3.13	0.79	1.02	3.89	.	1450	788
6	3.36	0.56	1.50	1.22	0.58	1550	847
7	3.44	0.63	1.55	2.22	0.98	1525	830
8	3.15	0.66	1.18	3.18	0.86	1475	802
9	3.37	0.52	1.47	3.16	1.56	1500	815

Phosphorus, under 0.20; Sulphur, under 0.12. All specimens quenched in oil.

Table VI—Hardening by Air Cooling From 1700 Degrees Fahr.*

Iron	Section Inches	TC	Si	Mn	Ni	Mo	Cr	BHN
12491	2¼	2.50	2.50	.50	3.00	.75	.	419
12483	2¼	3.50	1.10	.50	5.00	.	1.25	430
8628	1.2	3.27	1.13	.	2.87	.	.81	324
3420	1.2	2.44	2.35	.91	2.42	.43	.	444
3421	1.2	2.65	2.29	.93	1.87	.56	.	449
MDB‡	1.2	2.78	2.36	.91	1.15	1.02	.	531
BLP	1.2	2.65	2.48	1.18	1.21	1.15	.17	516
BLP	2½	2.65	2.48	1.18	1.21	1.15	.17	477

*Unpublished data—Bayonne Laboratory, International Nickel Co.
‡"Molybdenum in Cast Iron"—data published by Climax Molybdenum Co.

Table VII—Analyses and Hardness of Hot Quenched Cast Irons

	No. 53	No. 54	MI
Total carbon	3.35	3.35	3.25
Silicon	1.30-1.40	1.30-1.40	1.75
Manganese	0.50-0.80	0.50-0.80	0.80
Sulphur	0.13-0.15	0.13-0.15	0.10
Phosphorus	0.30 Max	0.30 Max	0.30 Max
Nickel	2.00	1.50	.
Molybdenum	.	.	0.50
Chromium	.	0.50	.
Brinell Hardness "As Cast"	220	.	223
Brinell Hardness After Hot Quenching	388	.	341
Tensile Strength "As Cast"	.	.	47,500
Tensile Strength After Hot Quenching	.	.	75,500
AB Impact Strength* "As Cast"	.	.	44
AB Impact Strength* After Hot Quenching	.	.	61

*Impact tests were made on a Charpy type machine using a section of an unnotched arbitration test bar 1.125-inch in diameter broken on 6-inch center.

Table VIII—Properties of Induction Hardened Cylinder

Analysis:—	TC	Si	Mn	Ni	Cr	Cu	P	S
	3.11	1.86	0.67	0.63	0.26	0.12	0.12	0.12

50 Kg Vickers Hardness—Depth Below Hardened Inner Surface—inches													
0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.13	Center
544	541	539	536	536	549	544	492	338	252	248	245	248	248

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Ford Casts Cylinder Barrels Centrifugally

SAVING of 35 pounds of alloy steel per piece and 70 per cent in equipment costs has been accomplished by Ford Motor Co. in adopting the centrifugal casting process for production of cylinder barrels used in the Pratt & Whitney 2000-horsepower aircraft engine the company is building at its Rouge plant in Dearborn. So successful has the method proved that Ford already has made cylinders for other aircraft engines and is teaching other foundries how to cast the barrels.

The casting is done on a horizontally rotating mold, relying upon centrifugal force to whirl the molten metal to the outside of the mold. This centrifugal force results in a uniform casting with fine grain structure.

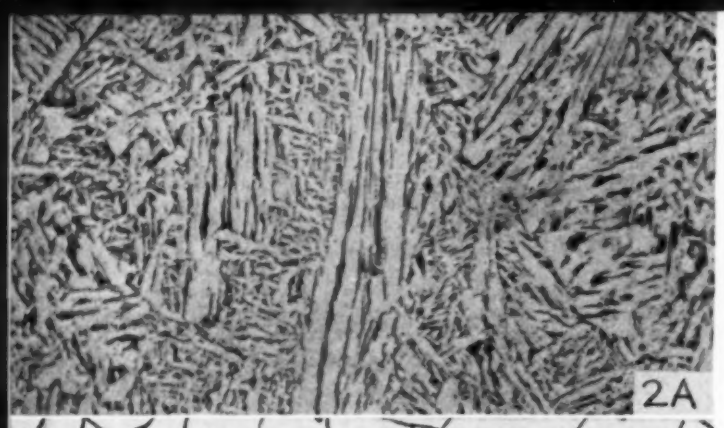
There is only a small percentage of excess metal, and little rough machining is required. In rough machining the forged barrel, more than 50 per cent of the steel is removed. This difference in material removed saves at least 15 minutes machining time on each cast barrel.

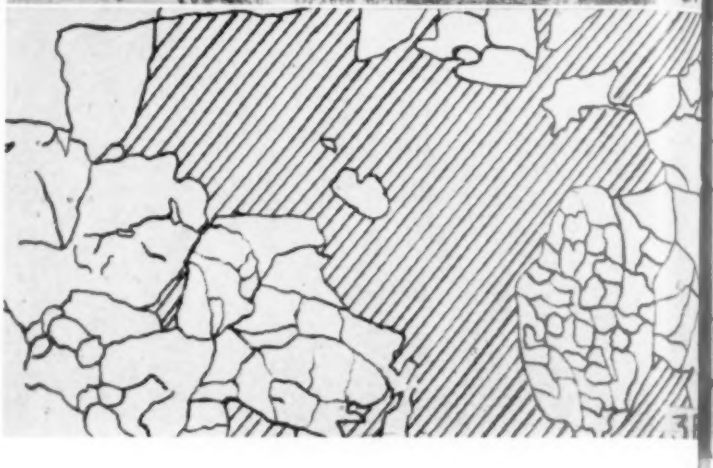
The cylinder barrel, 18 of which are required for each engine, is approximately 10 inches long and 6½ inches in diameter. In it travels the piston and around it is fitted an aluminum muff with fins which radiate heat from the barrel when the engine is running, thus cooling the cylinder. One end of the barrel fits into the crankcase, and to the other end is attached the aluminum cylinder head.

An old Ford principle is employed to speed the pouring —bringing the mold to the metal rather than pouring the hot steel into stationary molds. In casting the barrels the preheated molds are whirled in machines eight of which are mounted equally spaced on a revolving turntable. As each machine nears acid electric arc reservoir furnaces at one side, small ladles containing the proper amount of metal for one casting are brought quickly to the spinning mold for pouring.

Two of the stations around the turntable are used for unloading and loading, one for spraying the inside with suitable mold-coating, and one (*Please turn to page* 180)

Fig. 1—Heated mold being lowered into centrifugal casting machine. Mold is spun by rollers on which it rests during casting operation and is held in place by hinged lid of machine. Eight machines are mounted on constantly revolving circular platform. Fig. 2—Solution is sprayed inside revolving mold to prevent casting from sticking. Fig. 3—Molten steel from electric furnace is poured into revolving mold as each casting machine moves into place. Fig. 4—Mold and casting are removed from machine by overhead hoist and loaded on a conveyor. The machine then moves to next post, where empty mold is inserted and process repeated. Fig. 5—Each casting is weighed after being knocked from the mold. Fig. 6—Heat number stamped on each barrel is retained for checking purposes through subsequent machining operations. Fig. 7—Cast barrels awaiting heat treating and machining





FOUNDRY METALLURGY *in the* CASTINGS INDUSTRY

By John W. Bolton

The Lunkenheimer Co.
Cincinnati

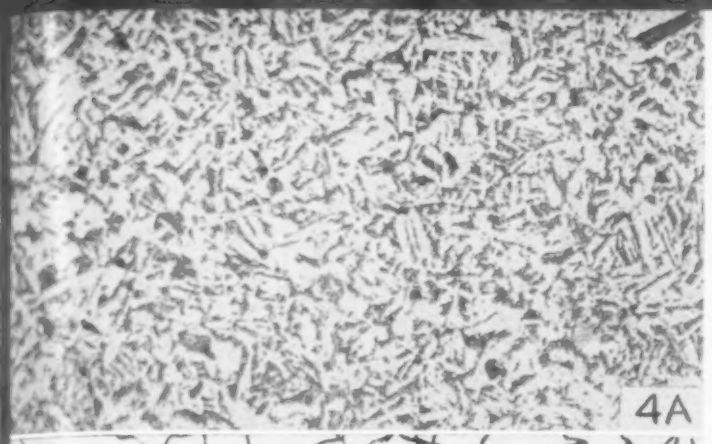
CUSTOMER acceptance is a good measure of efficiency in product improvement combined with effective selling. Cast steel enjoys customer confidence. This is among factors that make it one of the powerful sinews in war production. Its gains since the last war have been based on improvement and merit. No branch of the castings industry has exceeded the steel group in its consistent and co-operative backing of foundry metallurgy.

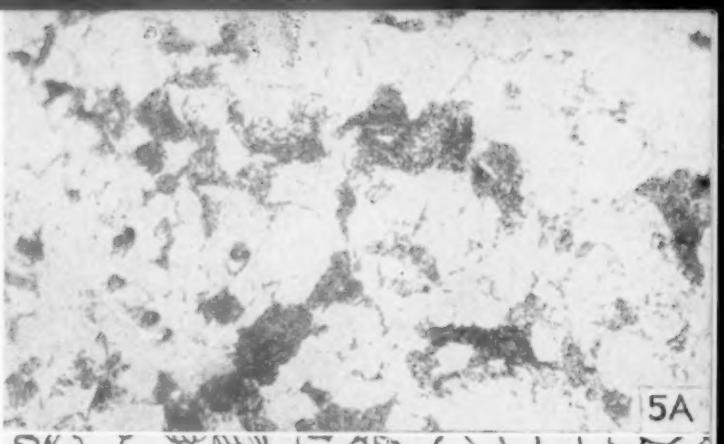
As a purchaser's representative after the last war the writer well recalls the crude controls and procedures seen in foundries visited. Few foundries made reasonably reliable castings, as measured by today's standards. Shrinkage defects, pinholes, cracks, non-uniform hardness and other shortcomings were common.

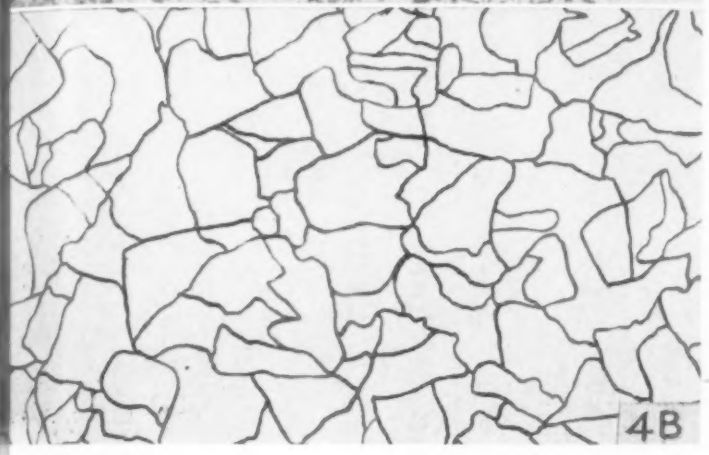
The sound, tough, reliable steel casting of today is a result of faith in and financial backing of metallurgical advance—carefully planned, well organized, and thoroughly sold to the engineer and designer.

The first essential of any metal structure is soundness. Steel is not the easiest of alloys to cast sound. (Our so-called foundry metals are in fact alloys. Even when we speak of "pure metals" in the foundry, some small additions are made to effect deoxidation, promote fluidity, and the like) Foundrymen faced the problem realistically and searching methods of test were adopted. Quoting Melmoth[7] ". . . there is a fear that radiographic inspection will be used as a whip to scourge the foundrymen rather than as a tool to help them. I do not believe that this is the correct mental attitude to take, and I am perfectly sure that *if we keep our minds open* we are going to use this new tool with very great advantage to ourselves." (Italics by writer.) Although this method was brought

This is the second of three installments comprising the first Foundation Lecture of the American Foundrymen's Association. The first installment, in the July issue, described metallurgical developments in gray iron. Cast steel, malleable iron, and onferrous metals other than light alloys are discussed in the accompanying text







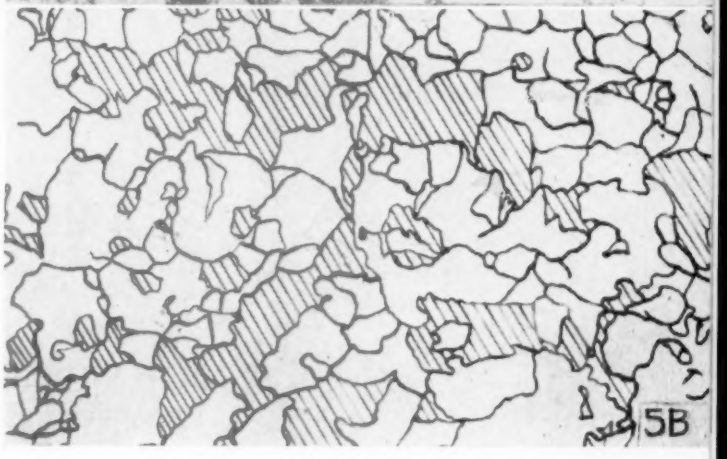
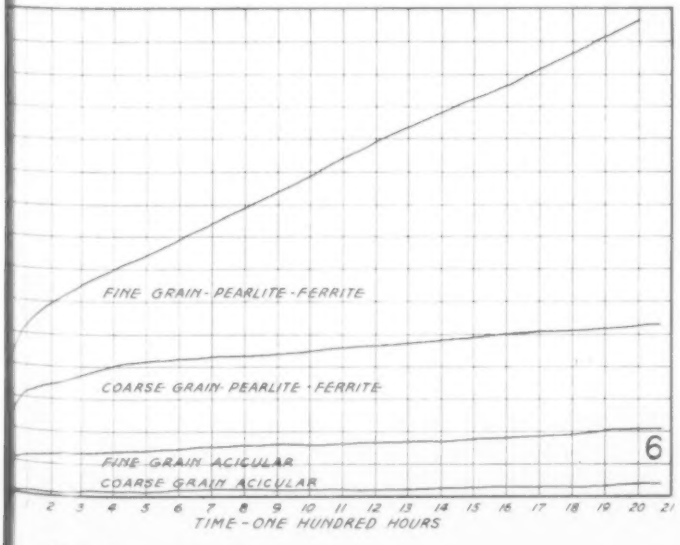


Fig. 2—(A) Coarse grained, acicular cast steel—500 diameters, etched. (B) Sketch showing grain boundaries of photomicrograph (A). Fig. 3—(A) Coarse grained, pearlite-ferrite cast steel—500 diameters, etched. (B) Sketch showing grain boundaries of photomicrograph (A). Fig. 4—(A) Fine grained acicular cast steel—500 diameters etched. (B) Sketch showing grain boundaries of photomicrograph (A). Fig. 5—(A) Fine grained pearlite-ferrite cast steel—500 diameters etched. (B) Sketch showing grain boundaries of photomicrograph (A). Fig. 6—Creep curves of cast carbon-molybdenum steel, at all loadings of 12,000 pounds per square inch at 950 degrees Fahr. Fig. 7—Effect of temperatures on carbon-molybdenum (WC1) steel

before the association[8] in 1925 some of its recent advance must be credited to the association's Steel Division committee and to the leadership of C. W. Briggs.

A paper[9] by Briggs and Gezelius may be credited with giving great impetus to the thorough study of the relationships of gating and design to production of sound castings. The interrelated questions of directional solidification, center-line shrinkage, contraction stresses, fluidity, design factors, use of chaplets and chills, atmospheric pressure risers etc. are well covered in recent *Transactions;* in the last 5 years we find Briggs, Brinson, Donaldson, Duma, Gezelius, Gregg, Kron, Lorig, Rominski and Taylor among A.F.A. contribu- (*Please turn to page* 181)


FINE GRAIN-PEARLITE-FERRITE
COARSE GRAIN-PEARLITE-FERRITE
FINE GRAIN ACICULAR
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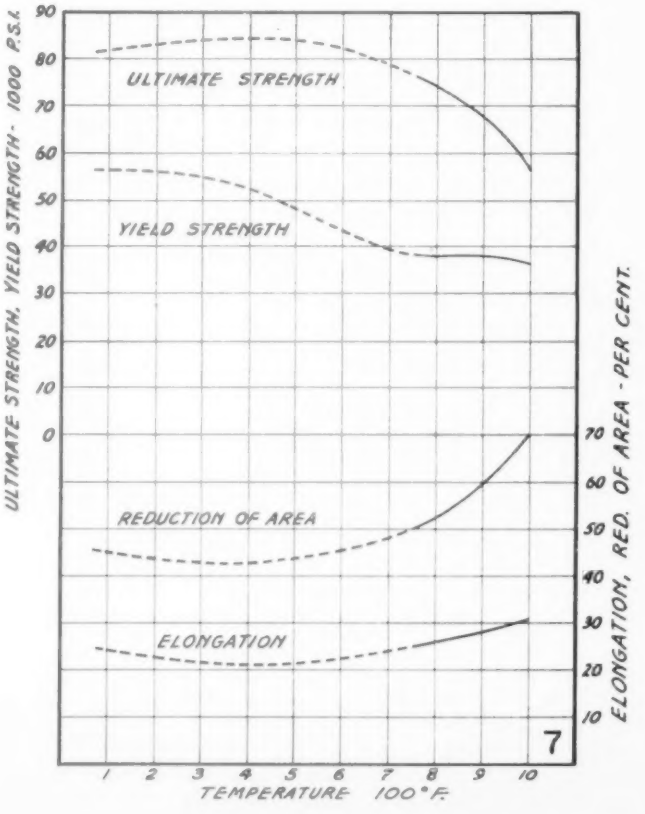
6
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
TIME-ONE HUNDRED HOURS


ULTIMATE STRENGTH
YIELD STRENGTH
REDUCTION OF AREA
ELONGATION
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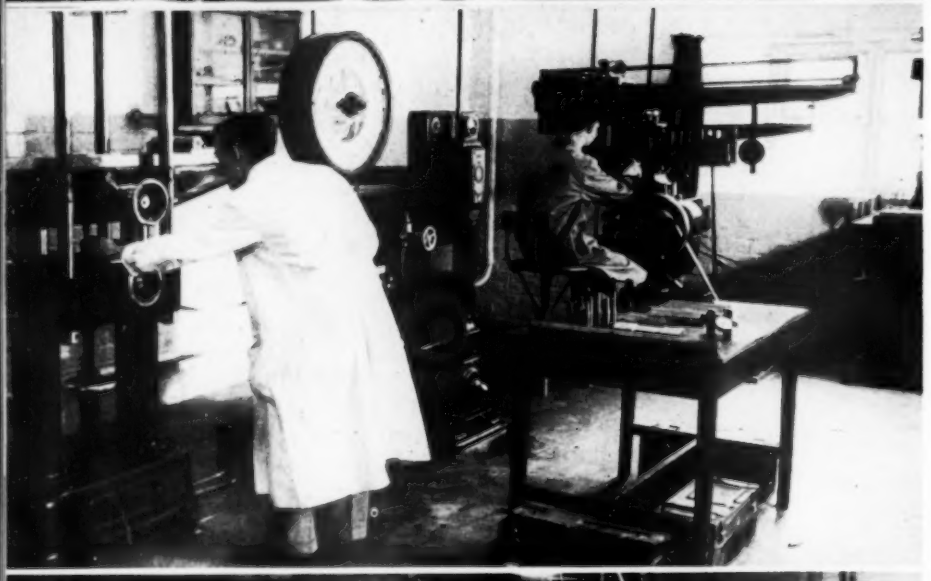
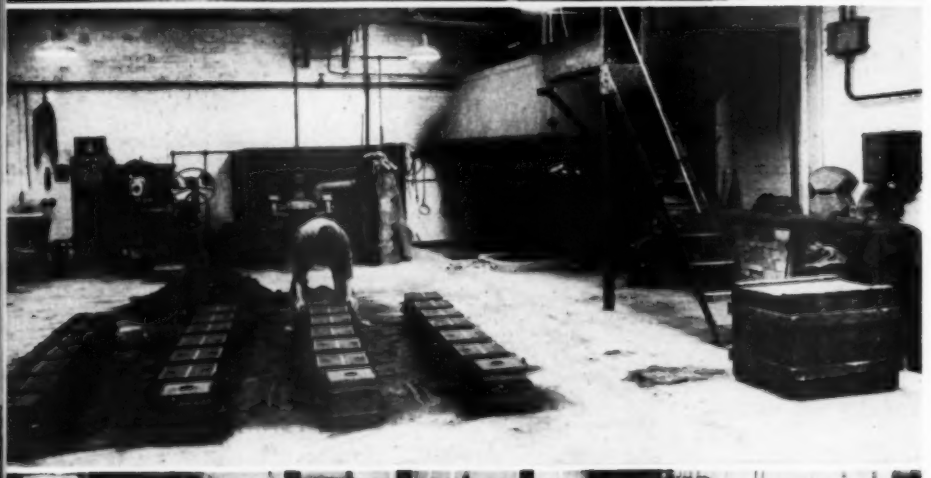
ELONGATION, RED. OF AREA - PER CENT.
90 80 70 60 50 40 30 20 10 0
70 60 50 40 30 20 10
7
1 2 3 4 5 6 7 8 9 10
TEMPERATURE 100° F.





British open new Laboratory

By VINCENT DELPORT
European Manager
THE FOUNDRY

Interior views of new laboratory of British Cast Iron Research Association showing machine shop, mechanical test department, experimental foundry and chemical laboratory. The main building (right), a one-time private residence, houses other departmental laboratories, administrative offices, and a library said to contain the world's most comprehensive collection of foundry literature

ON AN almost perfect early summer afternoon, leading representatives of the iron foundry industry in Great Britain met somewhere in Worcestershire, in the grounds of a one-time private residence, to attend the formal opening of the new premises of the British Cast Iron Research Association. The association (B.C.I.R.A.) was founded in 1921 and has for its objects to do research work on fundamental subjects of interest to the industry, to investigate and reply to inquiries on specific matters on behalf of its members, and to supply the services of a library and information bureau.

Originally the association was housed in an office in Birmingham, where it rented its first laboratory in 1924. The offices and laboratories were first combined under one roof in 1926, and were subsequently enlarged on three occasions.

Removal was contemplated before the war, and in April 1941, the council decided to move. The new premises were found during the summer of that year. Funds collected during the presidency of Lord Dudley, while adequate for the removal and adaptation of the premises proved to be inadequate for their acquisition, and the president, P. Pritchard, managing director of Mirmid Industries Ltd., undertook the negotiations for the purchase and loaned the purchase money, since repaid.

In planning the reorganization of the association in its new setting, further additions have been contemplated and provision of space has been made, in order to enable the association to play its part in assisting the industry to meet postwar problems. The present premises, although of old foundation, were modernized in 1935, and are well served with gas, water and electricity.

Working Conditions Ideal

The building is surrounded by grounds that cover 15 acres and, being 550 feet above sea level, extensive views to the south and west are offered, thus providing to the staff ideal conditions of work, seclusion, salubrious air, immediate access to healthy forms of relaxation and a beautiful landscape. A kitchen garden supplies the staff dining room. Rapid communication is ensured with the nearest city, which is 12 miles distant.

The main block of the building contains on the ground floor the administrative offices, library and information bureau, and the development department. The first floor houses the microscopic, physical metallurgy, sands and refractories, and vitreous enameling laboratories. Other buildings contain the machine shop and mechanical testing laboratory, the chemical laboratory, and the experimental foundry.

The experimental foundry (approximately 40 x 60 feet) is equipped for molding, melting and casting. Equipment includes a sand muller and a core oven. Shot blast equipment is being added. Shatter tests on coke can be made.

The melting furnaces include the following:

Crucible Furnaces. A coke fired crucible furnace for melting small charges from 25 to 100 pounds, for example a 50-pound charge may be melted from cold in two to three hours; an oil-fired tilting furnace, for charges from 200 to 300 pounds where a 300-pound charge can be tapped at 1360 degrees Cent. from cold in five hours, but temperatures of 1400 degrees Cent. and above can readily be obtained; a coke fired tilting furnace for charges up to 200 pounds is installed.

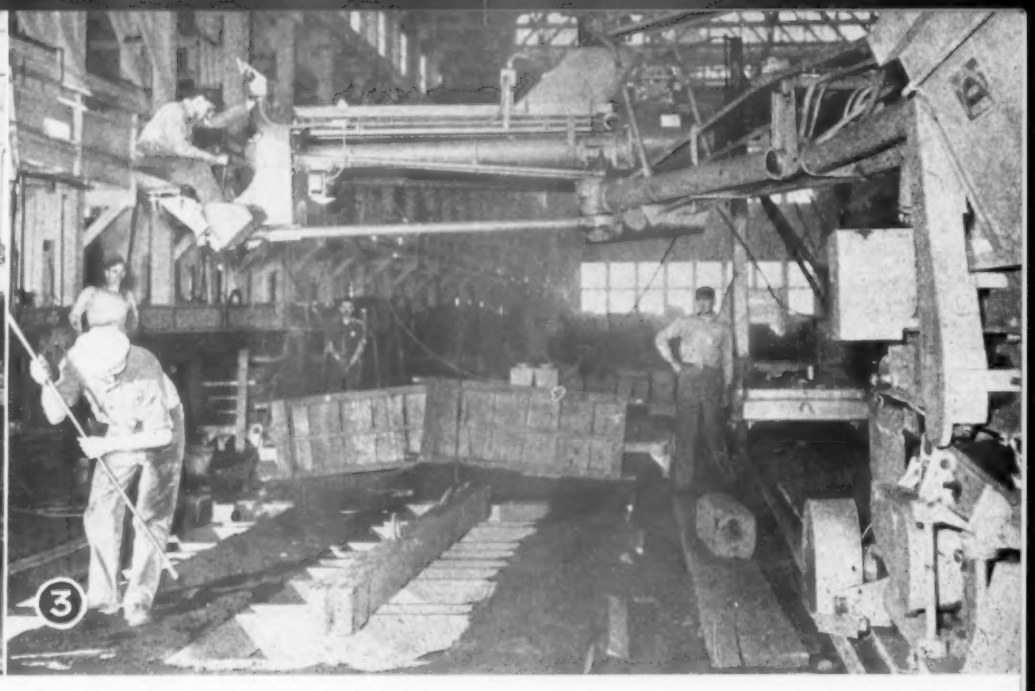
Cupola: A small cupola with an internal diameter of 12 inches, melts from 700 to 800 pounds per hour, with charges of 50 pounds of metal and 10 pounds of coke. The temperature of the metal at the spout reaches 1400 degrees Cent. and over, and irons of the highest quality can be produced, including acicular irons of 30-40 tons per square inch tensile.

Electric: A rocking arc furnace is used with a 50-80 pounds metal charge, which can be melted from one to two hours from cold, the running load being 25-30 kilowatts. There is a high frequency induction furnace for melting charges up to 10 pounds in weight; it is screened by an earthed cage to eliminate any transmission causing radio interference. An 8-pound charge can be taken up to 1500 degrees Cent. in about 45 minutes, the induction coil surrounding the crucible. A second unit enables charges of 20-25 pounds to be melted.

Other furnaces include a heat treatment furnace and gas fired furnaces for sintering and other tests on refractory materials. The latter can also be used for melting metal charges up to 7 pounds, this requiring 1½ to 2 hours. The heat treatment furnace can be used for cycles up to 1000 degrees Cent. on castings of varying dimensions. A temperature indicator and time switch are included on the control panel.

Delivery is awaited of a furnace giving annealing temperatures up to 1100 degrees Cent. fitted with a program controller by means of which the metal may be submitted to any annealing cycle, com- (*Please turn to page* 156)

Builds West Coast Foundry Record Time



KEEPING pace with demands of the war production program the new gray iron foundry of the Joshua Hendy Iron Works, Sunnyvale, Calif., one of the most complete in the West, was erected from first grading of the site to the taking off of the first iron in 135 days.

The new plant, with an overall area of approximately 125,000 square feet has an estimated capacity of 2000 tons per month. Under the limitations the war has imposed on obtaining men, materials and equipment, construction of the plant and putting it into operation in such a limited time stands as an outstanding accomplishment to the credit of Charles E. Moore, president of the firm.

He took the Joshua Hendy Iron Works about 2 years ago, and transformed it from an obsolete iron works plant with 60 employes to one of the largest marine engine plants in the world, now employing upward of 6000 people and revitalized to take an essential part in the tremendous war shipping program. The plant has had many interesting chapters in its history which dates from the early Gold Rush days of California. Its present chapter is the greatest.

The original order that started wheels turning at the plant called for twelve 2500-horsepower vertical triple expansion steam engines, power plants for the 10,500-ton Liberty ships that are forming the backbone of the nation's cargo shipbuilding program. When the U. S. Maritime Commission asked Mr. Moore if he could handle a double order, he said "Why not make it a hundred?" Taken at his word he proved it could be done and more. The plant already has manufactured 300 engines and is continuing with orders for many more, not only engines for the EC-2 Liberty ships, but also a lighter and more powerful 2750-horsepower engine which will power a new class of vessels, still shrouded in secrecy.

The company also moved ahead into another field and is building the first marine turbines on the Pacific coast. Smallest is a 4000-horsepower turbine, the main power plant for the C-1, another of the U. S. Maritime Commission cargo vessels. A series of 8000-horsepower tur-

Fig. 1—Tapping cupola at new foundry of Joshua Hendy Iron Works. Fig. 2—View of core room. Fig. 3—First sandslinger to be installed on Pacific coast. It has a ramming radius of 20 feet and moves the entire length of the main molding bay. Fig. 4—Large engine casting being cleaned by hydroblast. Fig. 5—Three hundredth steam engine built by company for U. S. Maritime Commission Liberty ships. Fig. 6—Press briquets 2 tons of cast iron borings per hour. Fig. 7—Engine cylinders being given final chipping in cleaning room

bines for the U. S. Maritime Commission C-3 cargo vessels soon will be in production.

Engineer John B. Bubb, whose work in foundry and industrial engineering has carried him to the industrial centers of the world, including the U. S. S. R., designed a modern, fast moving, large capacity foundry well adapted to the varied requirements placed on it by the expanded production needs. Emphasis has been placed on the need for easy and rapid flow of work.

With the plant on the main coast line of the Southern Pacific Railroad, the foundry has direct and easy access by spurs to rail service for delivery of sand, coke and metal. The building is a modern factory structure 294 x 425 feet in overall dimensions. Good lighting and good ventilation, two factors regarded as essential, generously have been incorporated into its design. A high and low monitor roof and all interior walls painted white provide ample light throughout the foundry. Control of ventilation is facilitated by the type of roof construction. The high bays provide traps for the gases which rise from the floor and pass out through louvres.

The foundry is divided into three main bays each 75 feet wide under a common roof, with an adjoining material yard 60 feet in width. Incoming coke and metals are unloaded directly from the cars to the material storage yard. Incoming molding sand is handled directly from the cars to an outside sand storage bin holding approximately three carloads, or to a hopper which leads to the conveying system serving the main sand storage, holding approximately eight carloads. The cupola charging floor extends into the material yard, and incoming materials may be unloaded directly to this floor. Incoming core sand is transferred directly from cars to storage bins in the core room in the east bay of the foundry. (*Please turn to page* 150)

Company officials: (Top)—Arthur Knutsen, foundry superintendent; (Center)—John B. Bubb, designing engineer of the new foundry; (Bottom)—Charles E. Moore, president. Fig. 8—Clamping device, developed by the company, enables copes to be clamped down in a few minutes, eliminating use of weights

A·S·T·M Reports on War Specifications

By EDWIN BREMER

WHILE contributions of the society to the winning of the war were emphasized at the forty-sixth annual meeting of the American Society for Testing Materials, these did not, as pointed out by Secretary-treasurer C. L. Warwick, exclude committee work and papers which have a long range significance. The meeting was held at Hotel William Penn, Pittsburgh on June 28 to July 1. Over 1400 attended 15 technical sessions and over 225 committee meetings were devoted to the discussion of specifications relating to various metallic and nonmetallic materials. New officers elected by the society include Dean Harvey, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., president and John R. Townsend, Bell Telephone Laboratories, New York, vice president. Mr. Harvey had served as vice president for the past 2 years, and succeeds H. J. Ball, Lowell Textile Institute, Lowell, Mass., as president. Executive committee members are: T. A. Boyd, General Motors Research Laboratories, Detroit; William H. Finkeldey, Singmaster & Breyer, New York; E. W. McMullen, Eagle-Picher Lead Co., Joplin, Mo.; E. O. Rhodes, Koppers Co., Pittsburgh, and Francis G. Tatnall, Baldwin-Southwark Division, Baldwin Locomotive Works, Philadelphia.

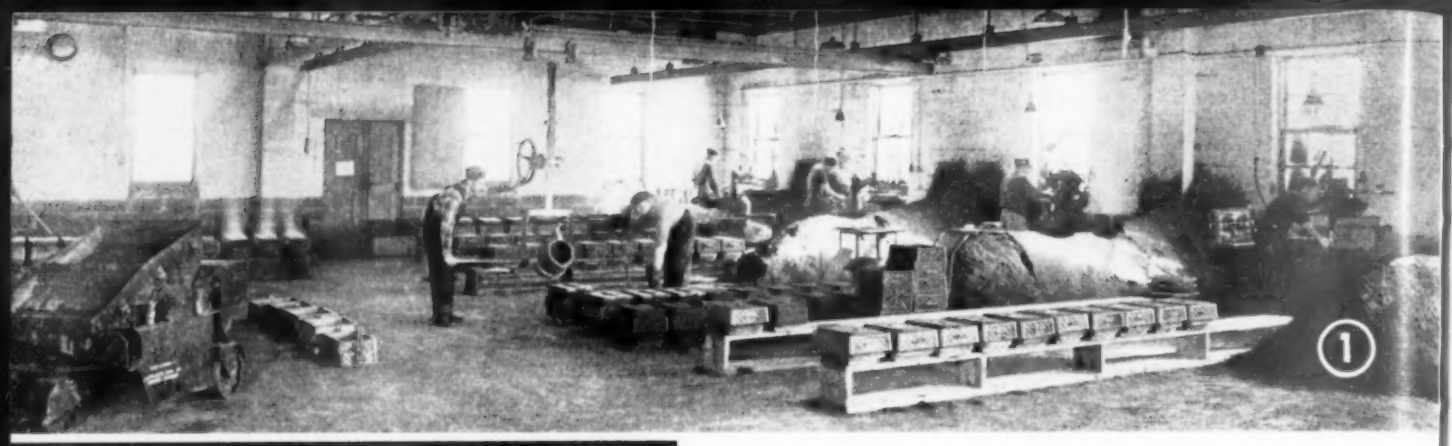
DEAN HARVEY
President-elect, A.S.T.M.

J. R. TOWNSEND
Vice President-elect, A.S.T.M.

The new officers were installed at the general session of the society held Wednesday night, June 30. This session included the annual report of the executive committee of the society presented by Mr. Warwick, the presidential address by Mr. Ball, and short addresses by Frank B. Bell, district chief, Pittsburgh Ordnance District, and Andrew H. Phelps, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Bell discussed briefly the gigantic task of the Army Ordnance in supervising the production of war materiel, and the importance of A.S.T.M. specifications in ordnance work. Mr. Phelps' topic was "Maintaining Quality Under Wartime Conditions." He pointed out the vast amount of research designed to develop materials for the conservation of strategic or critical metals and nonmetals, or to replace those no longer available. He stated that reduction of tin in bearing metal used by his firm and application of thinner bearings saved 130,000 tons of tin, that an excellent paper had been developd to replace Japanese tissue paper in condensers, and that plain carbon and low alloy steels are being applied successfully to replace those of a higher alloy content. Mr. Phelps credited the A.S.T.M. standards as an important factor in maintaining quality of American manufacture, and said that while in some cases there would be a return to pre-war materials, many of the new materials would hold their positions under post-war conditions.

Walter Bonsack, chief metallurgist, National Smelting Co., Cleveland, was awarded the Charles B. Dudley medal of the society for his paper, "Discussion of the Effect of Minor Alloying Elements on Aluminum Casting Alloys" in recognition of its merit as an original contribution on research in engineering materials. The eighteenth Edgar Marburg lecture was presented Wednesday afternoon by L. J. Markwardt, Forest Products Laboratory, and was entitled, "Wood as an Engineering Material". Mr. Markwardt summarized the more significant research accomplishments in that field, and discussed its utilization in the natural form as well as in its various modified forms involving use of glue and synthetic resins.

In a symposium on the hardness test in relation to design, held Tuesday night, June 29, under the direction of co-chairmen J. M. Lessells, Massachusetts Institute of Technology, Cambridge, Mass., and R. E. Peterson, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., the consensus was that the term hardness has an extremely vague meaning and may be used to define a number of different material properties. The subject was discussed by Mr. Lessells who made the introductory remarks, S. R. (*Please turn to page* 172)



Makes PATTERNS and Nonferrous CASTINGS

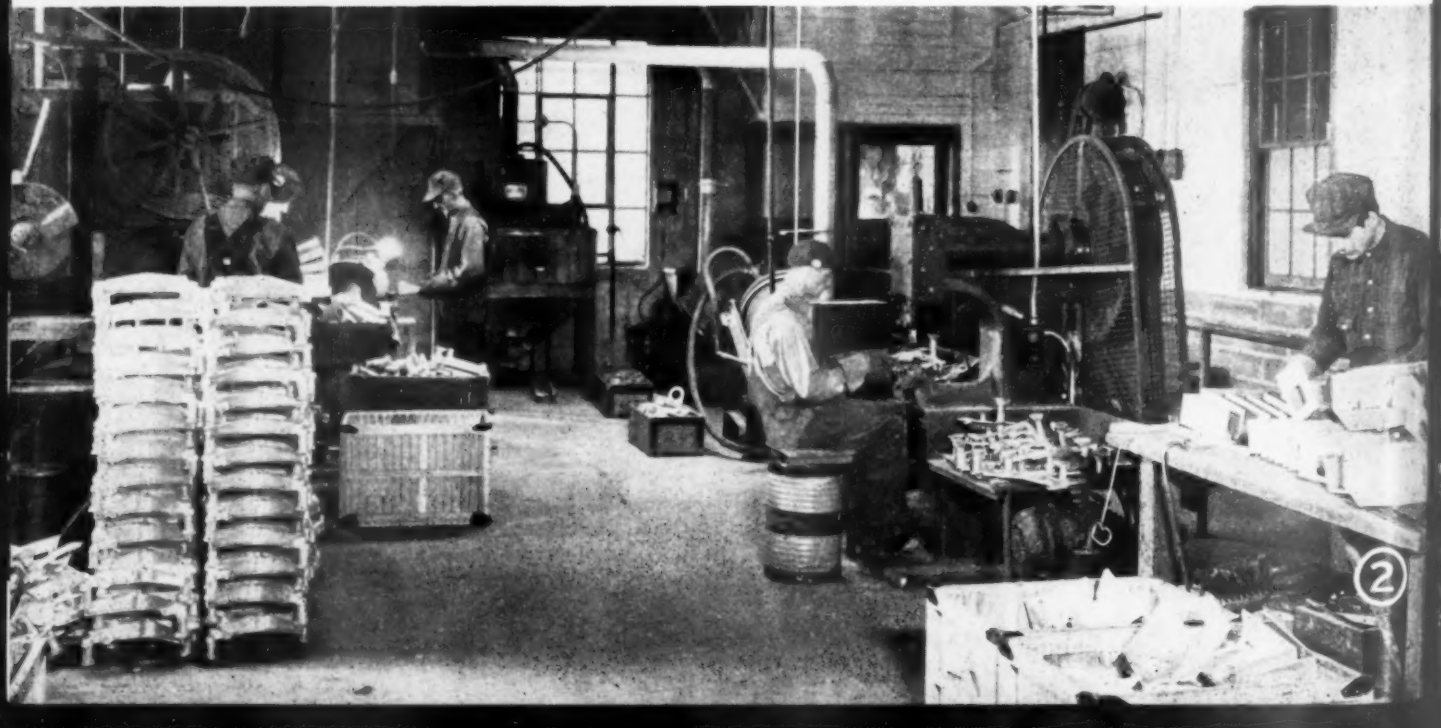
By Pat Dwyer

THE rapidly dwindling group of old timers who had advanced to the third or fourth grade in the 80s and 90s of the past century, and therefore were able to read and to smuggle books under their vests into school, highly appreciated the inspiring works of Horatio Alger. In hundreds, probably in thousands of cases, enthusiastic young readers felt an intense desire to emulate the adventures of the boy heroes in *Ragged Dick*, *Tattered Tom*, *Pluck and Luck* and 50 others with equally snappy titles which poured from the facile and prolific pen of the author over a period of nearly 30 years.

Captious critics, high brow literati, looked down their long noses and claimed that the books, while varying to some small extent in incident, r-a-ally were duplicates, exactly similar in plot, treatment and development. One went so far as to say that the stories were as drab, as dingy and as similar as the streets in that section of New York where the heroes originated and flourished.

Horatio long since departed for the happy hunting grounds. Three, perhaps four generations of boys have grown up without any knowledge of his inspiring works, but they have faced the future, fought their own battles and learned to stand on their own two feet just as optimistically and courageously as the pictureque little characters of whom Alger wrote so interestingly and entertainingly.

Pessimists with long faces and long memories may claim that conditions have changed during the past half century, that every field is over crowded, opportunities

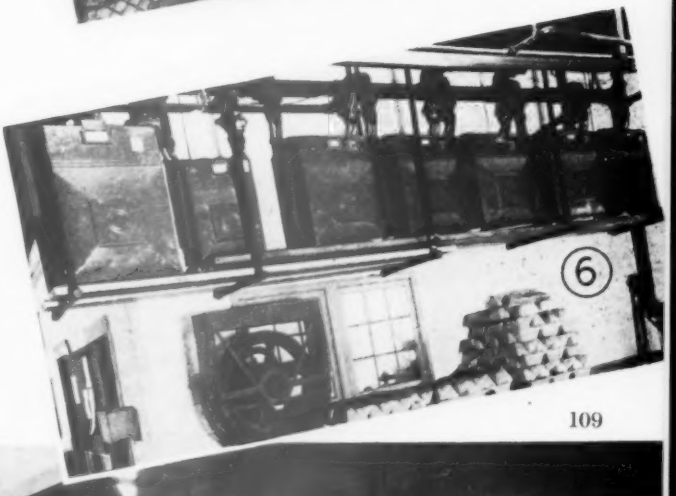


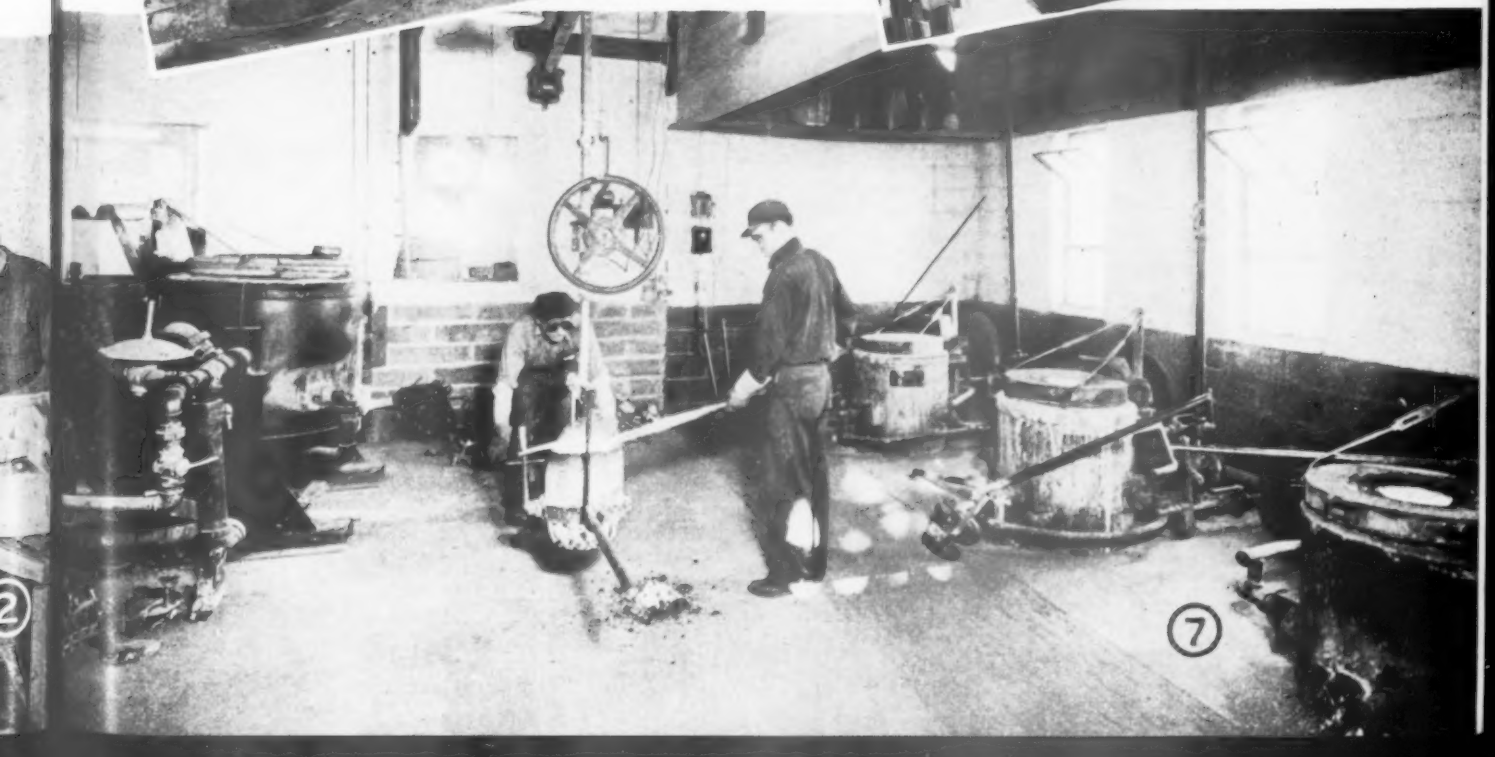
for advancement no longer exist. Ambition and energy are nice and commendable attributes, but the market has been flooded for many years with these commodities at a dime a dozen. In a word—to quote one of Mr. Alger's favorite expressions—pessimists firmly believe that the world in a hand basket is headed for a place whose name never sullied the pages of the famous author's works.

"Well," as another famous New Yorker so aptly remarked on more than one occasion, "Let's take a look at the record".

The record in this instance is that of Joseph S. Garske, owner, president and general manager of the Progress Pattern & Foundry Co., St. Paul, Minn. After finishing his apprenticeship he worked as a highly skilled journeyman patternmaker for 8 years. In the fall of 1935 he rented half the floor space in (*Please turn to page* 153)

Fig. 1—Molds are placed on skids for pouring, thereby curtailing amount of bending required of workers. Crane may be moved to permit pouring at any place on the floor. Fig. 2—Good housekeeping evidenced in cleaning department. Fig. 3—Aluminum melting room. Pouring ladles are spun from 16 gage stainless steel. Figs. 4 and 5—White walls contribute to cleanliness of plant. Fig. 6—Gas is used for fuel in melting and coremaking operations as well as in heating the foundry. Fig. 7—Melting room is another example of good housekeeping. Note device to hold crucible in pouring shank





Has Difficulty in Obtaining Kind of Coke Desired

Q.—Can you give us the names and addresses of makers of beehive coke? Our jobber does not always give us the straight run coke we order. Sometimes it is smaller than usual and we have cupola trouble.

A.—Under present emergency conditions hedged about with priorities and allocations, the average gray iron foundryman considers himself lucky to get any kind of coke. At one time beehive coke was considered essential for metallurgical purposes. With the rapid growth and improvement of the byproduct process, the use of beehive coke declined. Production had declined to a very low point when the present war demand created an insatiable market for metallurgical fuel. Long idle ovens were relighted, but even at present the production of beehive coke lags a long way behind the production of byproduct ovens. Some old time blast furnace and foundrymen still prefer beehive coke, but the great majority use byproduct coke with perfectly satisfactory results.

So far as size is concerned, you probably will run into as much small stuff in one variety as you will in another. This factor depends on the amount of handling to which the coke is subjected between the ovens and the foundry yard. Makers of beehive coke are few and far between and we doubt very much if they would accept a small order. The ideal size for your 27-inch cupola is about 2½ inches. Even in a badly smashed supply, your cupola man should be able to rescue the greater part. If necessary set up a 2½ or 3-inch mesh screen to retrieve coke for the cupola. Small coke passing through the screen can be used for other purposes, salamanders, core oven fires, boilers, etc.

Ladle Temperature Not Raised High Enough by Wood Fire

Q.—We operate a foundry in Australia and would like to have some information on a simple method for heating ladles for cast iron which range in capacity from 100 to 1500 pounds. We preheat them now with wood fires, but those do not raise the temperature sufficiently high.

A.—While many foundries still preheat or dry their ladles with wood fires with more or less satisfactory results, that method probably has the disadvantage of not heating the bottom as highly as the sidewalls due to the ash which acts as an insulator. Also the usual procedure of filling the ladle up with wood is very inefficient since a great part of the heat is lost to the atmosphere. Covering the ladle over with an iron plate or sheet after the wood has burned down to charred coals will aid in conserving the heat.

You presumably do not have oil available or you would have installed an oil burner for ladle drying. One procedure which we believe will give good results is to construct a simple furnace or grate for drying the ladles. All that would be necessary would be two walls spaced the distance of the top of your largest ladle. A ledge should be constructed on the inside of each wall about a foot from the ground to support a series of grate bars on which the fire can be built. Across the top is placed a perforated steel plate or a series of cast iron bars on which the large ladle or a number of smaller ladles can be up-ended so that the opening is down.

The fuel may be wood or preferably coke since it will supply more heat either by volume or by weight. Instead of making the walls of the furnace solid it might be wise to leave openings along the bottom of each side for air inlets in addition to the two open ends.

Wants Information on Tuyere Area of 50-inch Cupola

Q.—What is the recommended tuyere area for a cupola 50 inches inside diameter, melting 9½ tons per hour and consuming 300,000 cubic feet of air per hour? Basin for collecting the iron is 17 inches deep. What is the correct size and number of tuyeres and size of the wind box? What percentage of the basin space is taken up by the molten metal when it is allowed to accumulate to a depth of 15 or 16 inches?

A.—Your present performance of melting 9½ tons of iron per hour in a 50-inch diameter cupola represents the approximate maximum capacity of a cupola that size. The cross sectional area of a 50-inch diameter cupola is 1963 inches. Under favorable conditions a cupola will melt 10 pounds of iron per hour per square inch of cross sectional area, in this case 19,630 pounds. The size and shape of the tuyeres and wind box are not items of major importance so long as they are capable of delivering a definite volume of air. Present day practice favors a continuous tuyere opening into the cupola either in the form of two plates separated by upright ribs approximately 12 inches apart, or a number of individual tuyeres comparatively small at the wind box end, but flared horizontally at the delivery end to form a practically continuous opening.

On cupolas ranging in diameter between 48 and 72

inches the generally accepted ratio of combined tuyere to cross sectional area of the cupola is 1 to 4 or 5. The area of a 50-inch cupola is approximately 2000 inches, therefore the tuyere may range from about 400 to 500 inches. This means on a practical working basis either a continuous tuyere 2½ to 3 inches high, or eight individual tuyeres 5 x 10 or 5 x 12 inches flared at the delivery end to 5 x 16 inches. Size of coke will determine to some extent the holding capacity of the cupola well. The approximate holding capacity is half the total space. Total space in a well 50 inches in diameter and 15 inches deep is 29,447 cubic inches. Half of this multiplied by 0.26, the weight of a cubic inch of cast iron gives 3818 pounds as the amount of metal that can be accumulated in the well. For detailed and complete description theory and operation of the cupola we suggest perusal of *Melting Iron in the Cupola*, by J. E. Hurst.

Essentials of Plaster Molding Practice Are Presented

Q.—We would like to know something about plaster molding for nonferrous castings, and will appreciate any information you can give us.

A.—Plaster of paris has been used by certain foundries for a number of years in the production of silver, aluminum alloy and copper-base castings, and within the past few years a number of patents have been obtained on process and procedure. As a general rule the plaster of paris is mixed with other materials such as wood flour, shredded asbestos, brickdust, etc. to produce a stronger and more permeable structure. Those are mixed thoroughly in the dry state and then sufficient water added to provide a solution which can be poured into place. In some types of castings, such as statuary, the pattern is a wax model while in others it is wood or metal which is greased to prevent the plaster from sticking to it.

After the plaster is poured on the pattern, it is allowed to solidify or set following which the pattern may be removed. In the case of wax the pattern is allowed to remain in the mold. The plaster mold is air dried for a period of time, and then placed in a furnace where the temperature is raised gradually to 1400 to 1500 degrees Fahr. to drive off the last vestiges of moisture. The mold is allowed to cool to a temperature at which it can be handled easily, and then the metal is poured. The mold should not be allowed to become cold since it tends to pick up moisture.

Use Chills or Wedge Test Bars For Rapid Check of Iron

Q.—In the February issue of THE FOUNDRY on page 94 some details are given of chill tests, and mention is made of an earlier article on the subject, as well as wedge tests. Our foundry is in Australia and we do not have the back issues. Can you give us further information on chill tests?

A.—Chill test or wedge test bars are used in many gray iron foundries as a means of determining the suitability of the iron for certain types of castings. The chill test bar, as the name indicates, is cast against a chill while the wedge bar is poured in green or dry sand. The earlier article referred to mentions a chill bar ¾ x 2½ x 5 inches with the narrow face cast against the chill. The mold is open sand, and when the bar has cooled to a dark red color, it is cooled slowly in oil, and finish cooled in water. Then it is broken along the longest dimension, and the fracture examined for appearance, particularly for depth of chill.

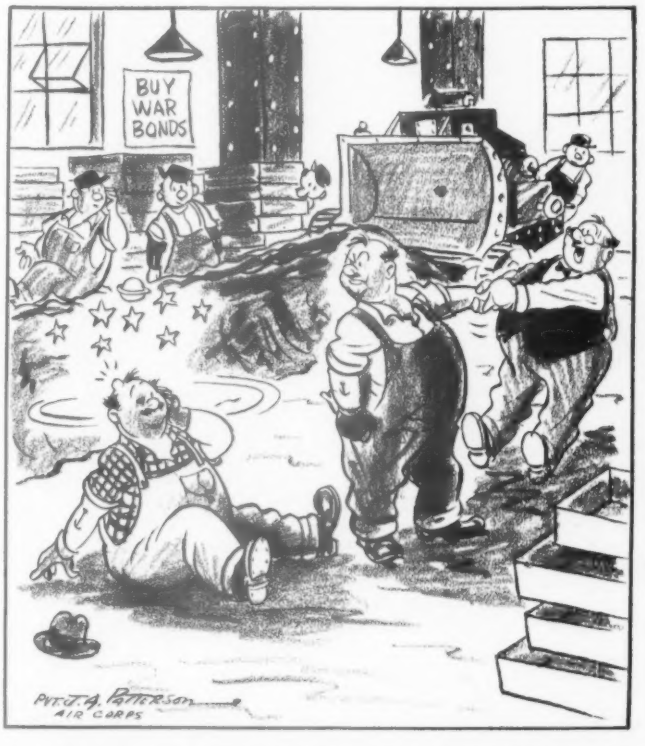
According to the author of that article an iron with a silicon content of 2.25 per cent will show no chill; with 2.00 per cent the chill will be just a hairline; with 1.75 per cent silicon the chill will be ⅛-inch, while at 1.50 per cent the chill will be ¼-inch, and so on until at 1.00 per cent the chill will be 1 inch deep. Those data, of course, are built up on standardized practice in the type of mold, pouring, quenching, etc., and on chemical laboratory determinations.

With the wedge bar no chill is required since the thin edge probably will chill with comparatively high silicon. It is preferable to make the mold of a core sand mixture and bake it so as to eliminate the moisture variable. Such a bar may be 4 to 6 inches long, 3 inches wide, and 1 inch thick at the heavy end; gradually tapering to a knife edge. Like the other bar, it is split along the long dimension to show the extent of the chill.

Use of the chill or wedge test bar is based upon experience with laboratory data. In other words, you know that a certain composition or mixture gives good results in some casting. The test bar made shows a certain chill for that particular mixture. Hence, the next time you make the casting you pour the test bar and determine from its appearance whether the iron is suitable to fill the mold. Such bars are particularly valuable when several different mixtures are melted in the cupola since they will show quickly the change in structure.

GANGWAY!

By Pvt. J. A. Patterson



"Great Scott, Herringbone, isn't there enough trouble in the world today without you two causing more?"

Foundry Plans Vary With Conditions

Q.—We are contemplating erection of new foundry buildings after the war is over and building restrictions are lifted. Do you know of any books or other literature dealing with layout and structural details of foundry buildings?

A.—So far as we know, no book is available on the subject of layout and structural details of foundry buildings. The subject in its many ramifications has been covered in articles which appeared in THE FOUNDRY. Descriptions of typical foundries have featured nearly every issue of this publication since its inception 50 years ago. A recent series of articles on the subject of foundry arrangement written by N. K. B. Patch appeared in the December 1941 and in the January, February, March and April, 1942 issues. These articles are concerned primarily with nonferrous foundries, but a great deal of the material applies to foundries in general. Obviously while all foundries are alike, in that their purpose is the production of castings, local conditions constitute the main factor in planning the establishment. As a plain matter of fact nearly every foundry is a tailor made job. The best advice we have to offer is that you consult engineering firms who have specialized for many years in the design, erection and equipment of casting plants. Names and addresses appear in the advertising pages of THE FOUNDRY.

Wants Information On the Cupola

Q.—We are erecting a new cupola 42 inches diameter inside the lining to be served by a skip hoist. The charging door is 6 feet high and the bottom sill is 21 feet above the bottom plate. How high should the stack be carried above the charging door to insure proper draft and prevent any back draft? We shall appreciate information on proper blast volume and pressure, also weight of coke and iron charges. We have been using 48-hour domestic coke with perfectly satisfactory results for many years. Would there be any advantage in changing over to foundry coke? We shall appreciate any additional information that may be of service in the installation of the cupola.

A.—Neither positive nor back draft is a factor in determining the height of the cupola stack above the charging door. As a matter of fact, there is no back draft. Early cupolas had no top stacks, and even today where conditions are favorable, the charges are dumped in through the open top of the cupola as in blast furnace operation. The only purpose of the upper stack is to confine the flames, sparks and smoke in a limited area, where they may be considered a nuisance or a fire hazard to plant buildings, or to buildings of property owners in the same neighborhood. In recent years several foundries have installed equipment to suppress the flames and to collect all smoke, sparks and dust at the top of the cupola stack. If you are located in a congested area, it may be advisable to consult your city fire department. Quite possibly there is a city ordinance covering certain features of cupola stacks.

Average melting speed of a 42-inch diameter cupola is 7 tons per hour. To melt this amount of iron the blower has to deliver approximately 3500 cubic feet per minute at a pressure of 12 ounces. Experience indicates that a 42-inch diameter cupola operates most efficiently on 1000-pound iron charges separated by 100-puond coke splits and 25 pounds limestone. This applies particularly to long heats where the cupola has to be kept clean. For shorter heats the amount of iron and coke in the charges may be increased to a considerable extent.

Efficiency of coke as a cupola fuel is measured partly by physical characteristics, but principally by carbon content. The physical characteristics are governed to a certain extent by the method of preparation in beehive or byproduct ovens. The carbon content depends on the volume of this element in the original coal. The subject is too long and complicated for reference in the time and space at our disposal. So far as you are concerned any coke that measures up to the following specifications will serve satisfactorily: Fixed carbon not under 86.00 per cent, volatile matter not over 2.00 per cent, ash not over 12.00 per cent, sulphur not over 1.00 per cent. If your local source of supply has met all your requirements over a period of many years, you would be ill advised to make any change.

Sand Adheres to the Casting Interior

Q.—We understand that some chemical solution is being used successfully to clean sand from castings, and we would like to have information on it. We are making tractor carburetors, manifolds, and other similar castings, and one of our problems is removing sand from them. At present we are using a tumbler and steel wire brush, but find it difficult to remove sand from the interior of the carburetor bodies.

A.—While it is true that sand can be removed from castings by chemical means, we believe that you will be much farther ahead to investigate your sand conditions, and eliminate the trouble at its source. The chemical agent used is a weak solution of hydrofluoric (not hydrochloric or muriatic) acid which attacks the silica of the sand without affecting the iron. The castings must be pickled until the silica is dissolved sufficiently to permit the sand falling off. Considerable care must be taken with hydrofluoric acid solutions since they cause nasty burns.

Your sand evidently must be in poor condition, or of a poor grade if it adheres to the castings the way you describe. Our suggestion would be to send a sample of it to some foundry sand consultant for examination. That individual then could advise you the best way to handle the situation. Apparently your sand lacks refractoriness or it is too coarse permitting the metal to penetrate between the grains, or it may be too high in clay content.

Learn How To Make Bronze Tablets

Q.—We shall greatly appreciate information on the subject of bronze plaques, tablets, name plates etc. This will include patterns, sand, molding, gates, flasks, metal composition and any other related features. In our younger days we worked as a molder in a stove plate shop, but we are not familiar with bronze foundry practice.

A.—So far as we know, no book ever has been published on the subject. Articles have been published on many occasions in THE FOUNDRY and in other technical publications. The technique of producing small plaques is practically similar to that employed in the stove plate industry with which you are familiar. The technique employed in the production of large plates embraces many specialized features and is altogether beyond the capacity of the ordinary molder. The work can be entrusted only to men skilled in the art through many years' experience.

Where only one casting is required the pattern may be wood with braces on the back. Impressions left in the cope by the braces are filled with sand after the cope is removed. Metal patterns are employed where a number of duplicate castings are ordered. Where the design includes ornamental features in addition to the letters, the original model is fashioned in clay. An obverse mold is made in plaster from the clay model, and then a plaster pattern is cast in this mold.

No. 00 Albany sand generally is employed for molding ornamental castings. However, other sands may be employed if they possess the necessary characteristics of refractoriness and fineness of grain. After the mold is made the surface is sprayed with molasses water and then skin dried with a charcoal fire or with a gas flame or oil torch.

In some shops, large tablets are cast on edge. Obviously a rigid dry sand mold in a strong iron or steel flask is required to prevent the casting from straining. The principal advantage of the method is that it insures even and proper distribution of the metal in a comparatively thin plate. Many foundrymen cast the plates in a horizontal position. Where the area is not too great, the casting may be gated along both sides, and in some instances at both ends. The preferred method is to provide a number of small wedge gates on top of the casting. These are connected to long horizontal runners and

(*Concluded on page* 114)

NICKEL AIDS THE FARM IMPLEMENT INDUSTRY

to KEEP 'EM SERVING!

America won a victory on the food front in 1942 with production that reached an all-time high. But even that wasn't enough to feed a hungry, war-torn world. So this year's objectives are higher.

Farmers need mechanical equipment to produce food in winning quantities. Now, with the critical shortage of skilled farm labor, modern machinery becomes vitally important.

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For years, the technical staff of International Nickel has been privileged to cooperate with the engineers and production men who are responsible for such great achievement in the improvement of farm equipment . . . equipment now working at top speed to feed the United Nations. INCO's staff of engineers and metallurgists offers counsel and data to all who seek assistance in the selection, fabrication and heat treatment of ferrous and non-ferrous metals.

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★ *Nickel* ★

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

(*Concluded from page* 112)
the runners in turn receive metal from one or two upright sprues.

Metal composition for tablets varies to some extent depending on the color required and to some extent on the style of finish. Under present conditions, of course, some adjustment must be made in the tin content. The three following mixtures are used extensively: 1—Copper 90 per cent, zinc 7.5 per cent, tin 2½ per cent. 2—Copper 88 per cent, zinc 3.5 per cent, tin 6 per cent, lead 2½ per cent. 3—Copper 79 per cent, zinc 20 per cent, tin 1 per cent.

Long and short articles on various phases of tablet manufacture have appeared in the following issues of THE FOUNDRY: May 15, 1923; Sept. 1, 1924; April 1, 1925; Oct. 1, 1928; Sept. 12, 1929; Nov. 15, 1930; Aug. 15, 1931; Sept. and October 1934. A chapter in the book *Gates and Risers for Castings* is devoted to foundry methods for molding and casting tablets.

Expects to Salvage Aluminum Turnings

Q.—We would like to have information on the best process for salvaging aluminum turnings and shavings from machining operations. We have a natural draft, coke-fired crucible furnace, and can obtain a contract to reclaim the material if we can obtain as much as 60 per cent good metal from the turnings.

A.—According to WPB Order M-1-d on aluminum scrap, effective Jan. 7, 1942 and last amended on March 16, 1943, you are prohibited from the use of such scrap except home scrap without authority of WPB unless you are an approved smelter. Foundries may remelt gates, sprues, risers and defective castings. That order also states that toll agreements which apparently is what your contract would be, must be authorized specifically by WPB. Hence, before going any farther, it is suggested that you get in touch with the nearest branch office of WPB and obtain information on whether or not you can do as you propose. Branch offices are located in your city.

While it is possible to reclaim turnings and borings in a crucible or iron pot furnace, we doubt that it would be a paying proposition. Such material is awkward to handle, and is handled best in a reverberatory type furnace. To obtain the best results the turnings and borings should be freed as much as possible from oil by centrifuging and then heating sufficiently high to burn off the remaining oil, but not to the point that the scrap is oxidized or burned. Procedure with the dry material is to form a heel in the furnace or pot by melting a quantity of heavy scrap. Then small amounts of the turnings and borings are pushed down into the molten heel so that they dissolve without being exposed to the furnace atmosphere any length of time. Since the additions of the turnings cool down the heel or bath, from time to time no additions should be made, and the bath temperature permitted to increase so that it will continue to dissolve the scrap without beginning to freeze or solidify.

Swivel Hooks Mean A Two-part Job

Q.—We are forwarding a swivel hook assembly and will appreciate your advice on a suitable coating to use on the stem so that it will be free to turn in the ring. We have tried a graphite coating but it is not satisfactory.

A.—The practically universal custom in foundries where these castings are made in great numbers is to coat the insert part of the stem with fine sand. These devices are the result of two and not of a single casting operation. The links, eyes or hooks forming an extension to the swivel bar are cast first. After a thorough cleaning, the neck of the bar is dipped in core oil and then dipped into any suitable receptacle filled with fine sand where a thin film of sand adheres to the oil. After the coating has been dried thoroughly in the core oven the prepared castings are placed in a second mold provided with cavities for their reception in proper relation to the mold cavities for the remaining part of the assembly. The thin film of sand disintegrates and runs out when the completed castings are cleaned in the tumbling barrel.

Cupola Melts Four Tons an Hour

Q.—We have an order for a considerable number of gray iron castings weighing approximately 1500 pounds each. Our cupola lined to 32 inches holds only about 500 pounds in the well. Do you think we need a larger cupola to handle the iron for this job.

A.—If necessary you could collect enough hot iron in the ladle to pour a 5-ton casting. From your statement that the well of the cupola holds only 500 pounds of molten metal before it is tapped, it is apparent that the tuyeres cannot be more than 5 or 6 inches above the sand bed. That is a satisfactory height for melting small amounts. For your present purpose you should raise the tuyeres to a point 12 inches above the sand bed. The cupola then will hold between 1000 and 1200 pounds per tap. If you need a slag hole for running long heats, the slag hole is formed about 3 inches below the tuyeres. Theretore to secure the maximum amount of iron in the well, the tuyeres should be raised another 3 inches.

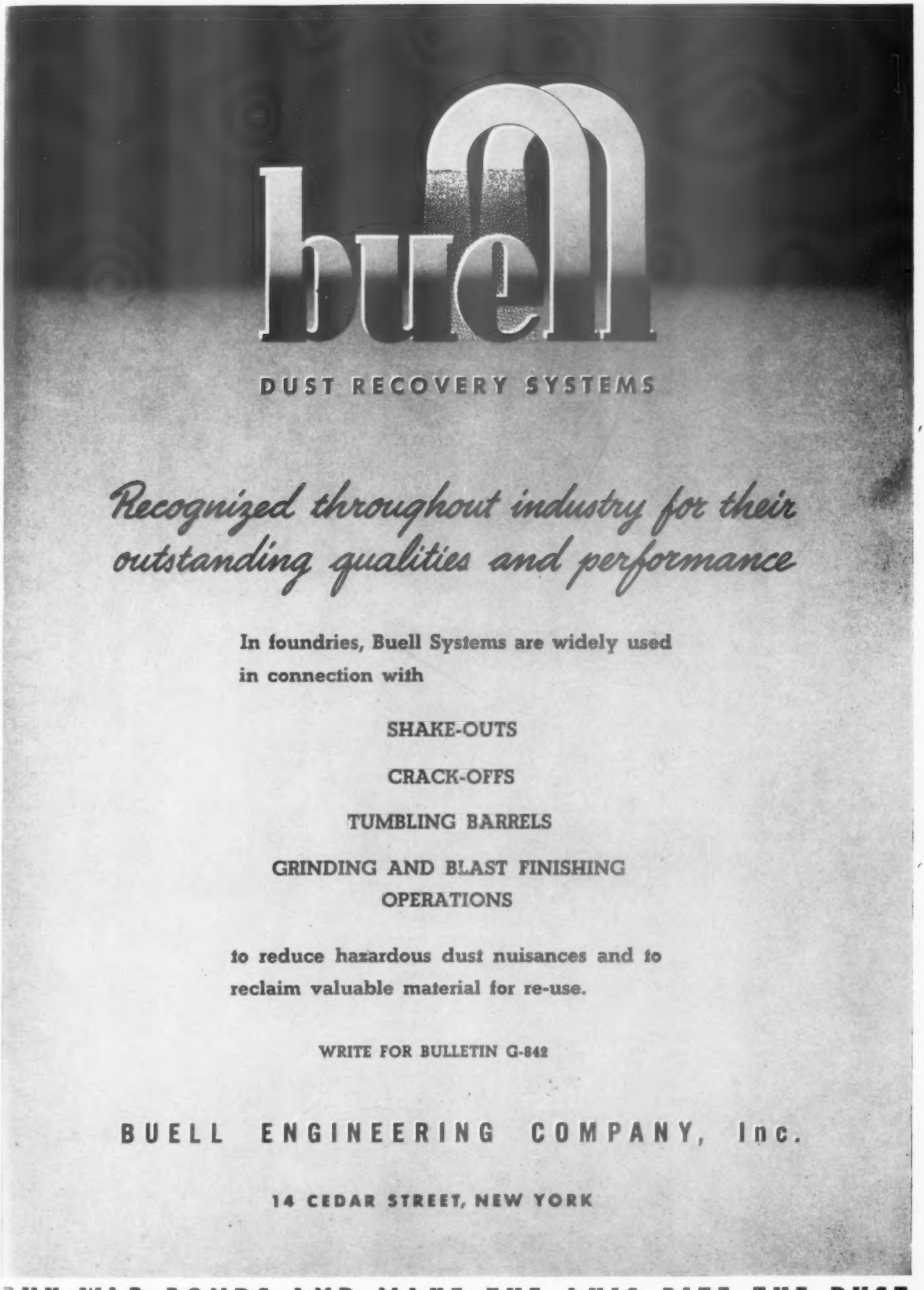
On short heats the number of tuyeres is not an important factor. However, on long heats the number and distribution are major factors, since they determine whether the cupola runs clean, or develops a bridge. In the present instance we suggest 8 tuyeres 4 x 4 inches at the shell opening into the wind belt, and flared to 4 x 10 inches on the inside of the lining. From the fact that only two tuyeres are on the present cupola, we assume that the blast pipe is forked and that there is no wind belt. For long heats a wind belt is necessary. This is a chamber outside the shell in which the blast from the main pipe is distributed to all the tuyeres. The size may vary to a considerable extent without affecting the efficiency. In your case we suggest a wind belt 6 inches wide and 18 inches high.

To serve the cupola satisfactorily you will need a 10-horsepower motor and fan capable of delivering approximately 2000 cubic feet of air per minute. A 32-inch cupola has a melting capacity of about 4 tons per hour when charged and operated properly and can be run for as many hours each day as the lining will stand up.

Long Bushing Kicks From the Core

Q.—We are experiencing a certain amount of trouble with long brass and bronze bushings or tubes approximately 50 inches long, cast in permanent molds. Although the technique of molding and casting is similar in all cases, some of the castings are perfect, while the others are rough and dirty. The molds are set up in a vertical position and the metal is poured in at the top. The core, 2½ inches diameter, is swept in loam on a 1½-inch perforated steel pipe centered in a tapered core print in the bottom of the mold. The pipe is wrapped spirally in corrugated paper and then a rough coat of loam is swept on. This is dried in the oven and then a finishing coat is applied. After this has been dried in the oven, the surface is coated with a proprietary facing. The loam is a mixture of No. 0 Albany new sand, bank sand and old sand.

A.—The so-called loam is too tight and hard. Permeability is too low for proper escape of gas generated when the core is surrounded by molten metal. The probable explanation why some castings are satisfactory, while others are rough and dirty is that the sand mixture is on the border line. In some instances it is just sufficiently permeable to get by. In other instances the permeability is below the border line with resultant scabs, buckles, rough areas and blowholes in the casting. The physical properties of the new sand and the bank sand may remain constant, and the amounts of new, bank and old sand may be measured carefully. But you probably overlook the fact that each time sand is used, the proportion of fines is increased. Thus while the amount of fines in one batch of old sand may not be objectionable, the amount in another batch of sand which has been used repeatedly, may be sufficient to reduce the permeability below the danger line. Our suggestion is to discard all your present old sand and build up a new supply of a coarse open grade to be used for the rough coat. The finishing coat may be the No. 0 Albany as at present.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BUELL ENGINEERING COMPANY, Inc.
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BUY WAR BONDS AND MAKE THE AXIS BITE THE DUST

MEN ...of Industry

JOSEPH L. MULLIN has been appointed general superintendent of foundries for the American Manganese Steel Division of the American Brake Shoe Co. He has been works manager at the New Castle, Del., plant, but will make his headquarters at offices of the company at Chicago Heights, Ill.

Mr. Mullin was employed in 1914 by the then Edgar Allen Manganese Steel Co. as clerk in the annealing department. He rose through successive stages to the positions of local purchasing agent and foundry superintendent, becoming works manager in 1928. Foundries which will be under Mr. Mullin's supervision, are located at Chicago Heights, Ill., New Castle, Del., Oakland, Calif., Denver, Colo., Los Angeles and St. Louis.

W. F. Kelly, plant superintendent at New Castle, has been named works manager there to succeed Mr. Mullin. He joined the American Manganese Steel Division in 1925 and has advanced through various positions.

♦ ♦ ♦

Wilbur R. Varney has resigned as metallurgist and department superintendent, Taylor-Wharton Iron & Steel Co., Easton, Pa., to accept a commission as a lieutenant in the United States Naval Reserve. For the past two years, Mr. Varney also has been teaching metallurgy and metallography at Lafayette College under the engineering, science and management war training program. Mr. Varney is a native of Boston and was graduated from Northeastern University in 1937 with a bachelor of science degree in chemical engineering, and he earned a master of science degree in 1938 from Rensselaer Polytechnic Institute where he held a graduate fellowship in metallurgy. His former affiliations include metallurgical positions with Hunt-Spiller Corp., Boston, and Bethlehem Steel Co., at Sparrows Point, Md.

WILBUR R. VARNEY

♦ ♦ ♦

Roy L. Salter has been appointed general superintendent of the Southern Wheel Division of American Brake Shoe Co., with headquarters at 230 Park avenue, New York. (THE FOUNDRY regrets that in presenting this announcement in the July issue, an incorrect caption accompanied the reproduction of Mr. Salter's photograph.) A graduate of Alabama Polytechnic Institute, Mr. Salter joined the division in 1924 as assistant foreman at the Savannah plant. Five years later he became superintendent of the Portsmouth plant, and in 1936 he was transferred to the Southern Wheel plant at Sayre. The following year he was given a leave of absence to join the Association of Manufacturers of Chilled Car Wheels as engineer of tests, inaugurating the associations's wheel inspection program. Mr. Salter joined Southern Wheel last fall as acting general superintendent of the nine plants operated by American Brake Shoe Co.

♦ ♦ ♦

David M. Whyte, for the past 20 years foundry superintendent, Cooper-Bessemer Corp., has been appointed supervisor in charge of casting sales for the corporation's two foundries, one at Mt. Vernon, O., and the other at Grove City, Pa. Mr. Whyte was born at Motherwell, Scotland and as a young journeyman molder arrived in the United States in 1908 where he worked for some time in the E. W. Bliss Co. foundry in Brooklyn, N. Y. Later he spent 6 years with the Mumford Molding Machine Co. and

(*Continued on page* 118)

ROY L. SALTER

DAVID M. WHYTE

JOSEPH L. MULLIN

W. F. KELLY

Now As Always

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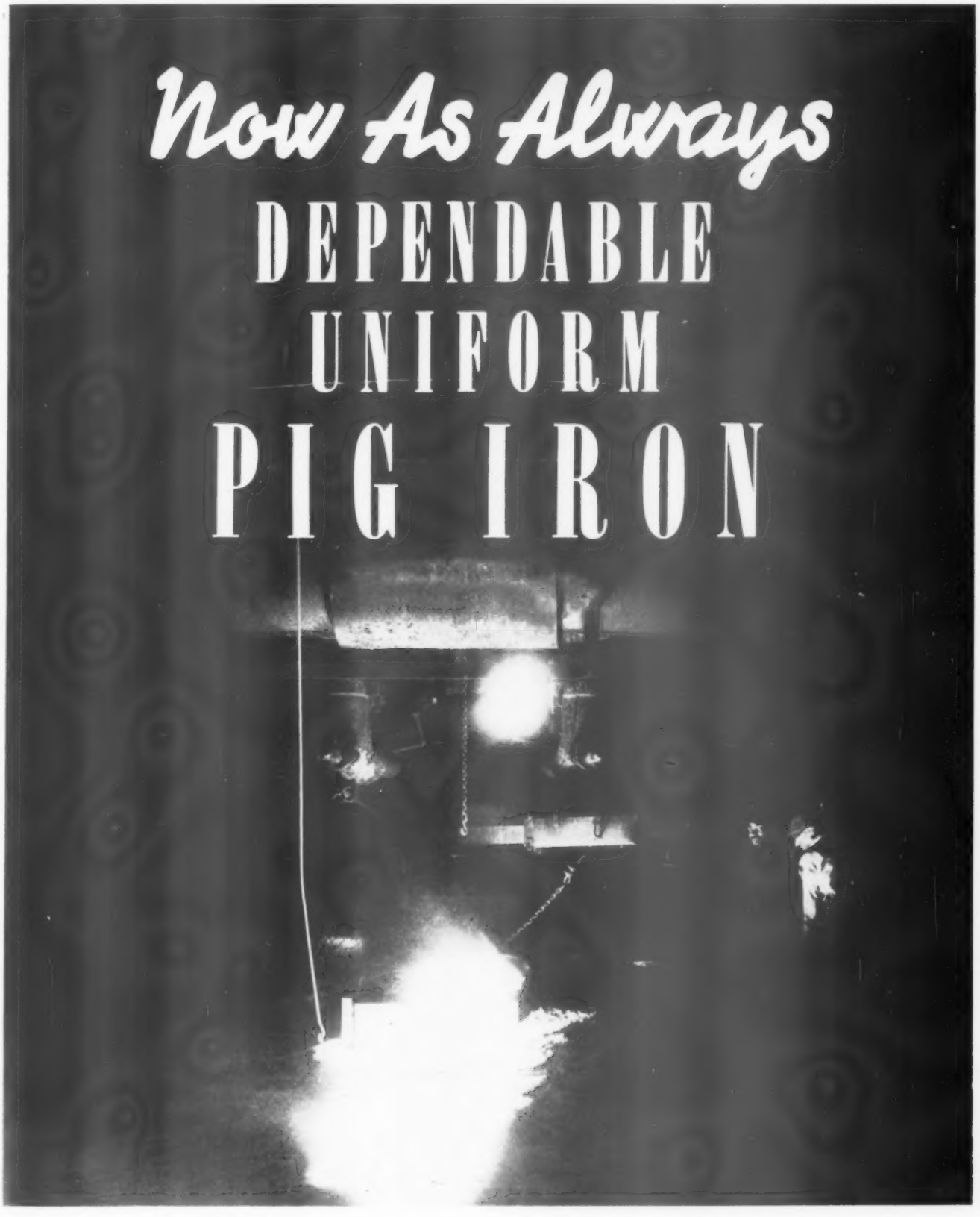

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M. L. DOELMAN

WILLIAM P. WOODSIDE

ALVIN J. HERZIG

CLYDE WYMAN

(*Continued from page* 116)

traveled extensively as demonstrator, salesman and foundry engineer. For several years he held supervisory positions in succession with the Goulds Pumps, Seneca Falls Machine Co., and Rumsey Pump Co., Seneca Falls, N. Y. He became assistant superintendent in the foundry of the C. & G. Cooper Co., Mt. Vernon, O., in 1923, later superintendent and general pattern shop and foundry superintendent of the two plants when the C. & G. Cooper Co., Mt. Vernon, O., and the Bessemer Gas Engine Co., Grove City, Pa., were merged as the Cooper-Bessemer Corp., in 1931.

♦ ♦ ♦

M. L. Doelman has been appointed representative for the Foundry Equipment Co., Modern Equipment Co. and National Engineering Co. in western New York, northern Pennsylvania and parts of Canada. Mr. Doelman received his early foundry training with Donner Steel Co., Union Car Wheel Co. and American Radiator Co. Advanced to assistant foundry foreman by American Radiator Co. in 1923 and sent to the Bayonne, N. J., plant, he remained there one year before joining Union Radiator Co., Johnstown, Pa., as foundry superintendent. The latter company was merged into National Radiator Corp. which sent Mr. Doelman to Framingham, Mass., in 1927 as general plant superintendent. Two years later he joined Gurney Foundry Co. Ltd., Toronto, as plant manager, staying there until 1940, when he became general manager of Electric Steels Ltd., Cap de Madeleine, Que. An active member of the A.F.A., Mr. Doelman was elected chairman of the Eastern Canada and Newfoundland chapter for 1943.

♦ ♦ ♦

William P. Woodside has resigned as vice president in charge of research of Climax Molybdenum Co. and intends to spend the major portion of his time on his Michigan farm. He joined the company in 1926 and, largely through his influence, the Climax research laboratory was established in 1931 under his supervision as director of research. Mr. Woodside is a founder member of the American Society for Metals. **Alvin J. Herzig** will take over Mr. Woodside's duties while still retaining his position as chief metallurgist of the Climax company. Mr. Herzig joined the company in 1931.

♦ ♦ ♦

Clyde Wyman has been appointed chief metallurgist for Burnside Steel Foundry Co., Chicago, in charge of melting, heat treating and laboratory. A native of Oshkosh, Wis., Mr. Wyman attended Marquette University, Milwaukee, and spent 5 years in the latter city with Sivyer Steel Castings Co. For the ensuing 3 years he was metallurgist for Sterling Electric Steel Co., East St. Louis, Ill., and for the past 17 years he was associated with Oklahoma Steel Castings Co., Tulsa, Okla., as metallurgist and assistant works manager.

♦ ♦ ♦

George W. Anselman, associated with Ayers Mineral Co., Zanesville, O., as service engineer and superintendent of the company's Tennessee mill, has resigned to become service engineer, Goebig Mineral Supply Co., Chicago. (THE FOUNDRY regrets that in presenting this announcement in the July issue, an incorrect caption accompanied the reproduction of Mr. Anselman's photograph.) Mr. Anselman received his training in metallurgy at Lewis Institute, Chicago, and served his apprenticeship at Western Electric Co., Chicago.

♦ ♦ ♦

Stowell C. Wasson has been transferred to Chicago as manager of the National Malleable & Steel Castings Co.'s works at Cicero and Melrose Park, Ill. Recently he had been manager of the company's Indianapolis works where he had spent his entire business career,

(*Concluded on page* 161)

GEORGE W. ANSELMAN

WILLIAM M. EWING

RAYMOND S. DAVIS

STOWELL C. WASSON

3 BOOSTERS for Truline Binder

"FASTER RAMMING . . ." *Truline Binder* is ground to a uniform fineness specification of 80% passing a 200 mesh. It therefore mixes readily, giving good distribution and producing a mix with controlled green strength and good flowability and workability. A Truline-mix rams easily to give smooth cores, thus enables the operator to turn out *more cores per hour.*

"FASTER BAKING . . ." *Truline Binder* hardens under low oven heat and dries without requiring oxidation. Consequently, baking time is reduced . . . and output increased. What's more, since Truline Binder is not water soluble and does not absorb water, cores can be stored for a considerable time without loss of strength.

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JJ-62

Among DETROIT Foundries

BY A. H. ALLEN
Detroit Editor,
The Foundry

COMBINING compactness with a degree of good housekeeping seldom observed in the foundry industry is the small tool steel foundry operated here by Gorham Tool Co., Detroit. Not only is the foundry itself unusual, but likewise is the idea of casting special analyses of high-speed types of tool steel in green sand molds. Usually such tool steel is forged from an ingot into the tool form, and the latter machined to final shape. With sand casting, it is possible to form the tool blank more nearly to its final shape, saving metal and machining time. More recently a technique has been worked out for casting a tool repair steel in the form of welding rod. The latter is used in connection with an oxyacetylene torch to reclaim broken tools, lengthen the life of tools and machine parts, and even to build up new tools.

The small yet fully equipped tool steel foundry is complete with electric induction melting furnaces, sand preparation and reclaiming system, molding benches, shakeout, sandblast, heat treating furnaces, pattern shop and laboratory. The casting and molding floor occupies a rectangular area in the main section of the foundry building and is served by a narrow-gage track embedded in the concrete floor, on which travel small cars carrying molds. The cars are pushed manually from molding stations to pouring station to shakeout and finally back on a closed loop to the molding section. The entire area is served as well by an overhead 2-ton crane which spans the full width of the building and gives access to any point on the floor.

Pouring department is in one corner of the building, with melting furnaces on a platform about 18 inches higher than the rest of the floor. Electrical equipment, including switches, relays, condensers and motor-generator set are housed in a bricked enclosure directly behind the furnace platform, with controls and meters on a panel outside the power substation. An electric fan maintains positive pressure in the electrical station and forces air out through tunnels carrying power lines to the two main furnaces, thereby keeping the generator room fairly dust-free. Line voltage is boosted from 220 to 800 and frequency from 60 cycles to 3000 by means of the generator which is driven by 160-horsepower motor. A two-way switch provides for feeding this current to either one of the induction furnaces.

The furnaces are the standard induction type with sillimanite crucibles having capacity for 200-225 pound melts on 40-45 minute heat cycles. Crucibles are charged with mild steel or high-speed steel scrap (about 40 per cent return and 60 per cent new) which is kept classified in nearby bins and as the steel melts down, slag is skimmed off and the various ferroalloys are added in specified amounts to produce the desired end analysis. A storeroom adjacent to the furnace floor contains barrels of cobalt, ferromolybdenum, ferrovanadium, ferrochrome and boron carbide, as well as ferromanganese and ferrosilicon. Basic analysis of the Gorham metal is 8 per cent molybdenum (this is now being changed to around 6 per cent), 8 cobalt, 4 chromium, 2 vanadium and 1 per cent boron, the balance iron. Inclusion of boron is the key to the success which has attended the casting of the tool material, boron, in addition to being a powerful deoxidizer, is a valuable alloying stimulant to improved flow of the hot metal in sand molds.

Since boron is a powerful deoxidizer, it is not added to the melt until the last third of the cycle and recovery averages 65-70 per cent. In the form of boron carbide, the material is a coarse, black granular compound.

Vanadium, manganese and silicon alloying is accomplished just before the heat is ready for tapping. Temperature of tapping varies of course with the dimensions of the castings being poured, and ranges from a high of 2950 degrees Fahr. for welding rod metal on down to around 2500 degrees for centrifugal and permanent mold castings.

Furnaces are in virtually continuous service throughout the day, one being charged while the other is melting. Cru-

(*Concluded on page* 122)

(Left)—One of five molding benches, with operator inspecting finished mold for cast tool steel blank. (Center)—Pouring molds on car which travels on narrow-gage track around foundry. Note weights on molds to hold down copes. (Right)—One type of die for centrifugal casting tool steel blanks. Plugs are fitted into ends of grooves before mold is poured and spun

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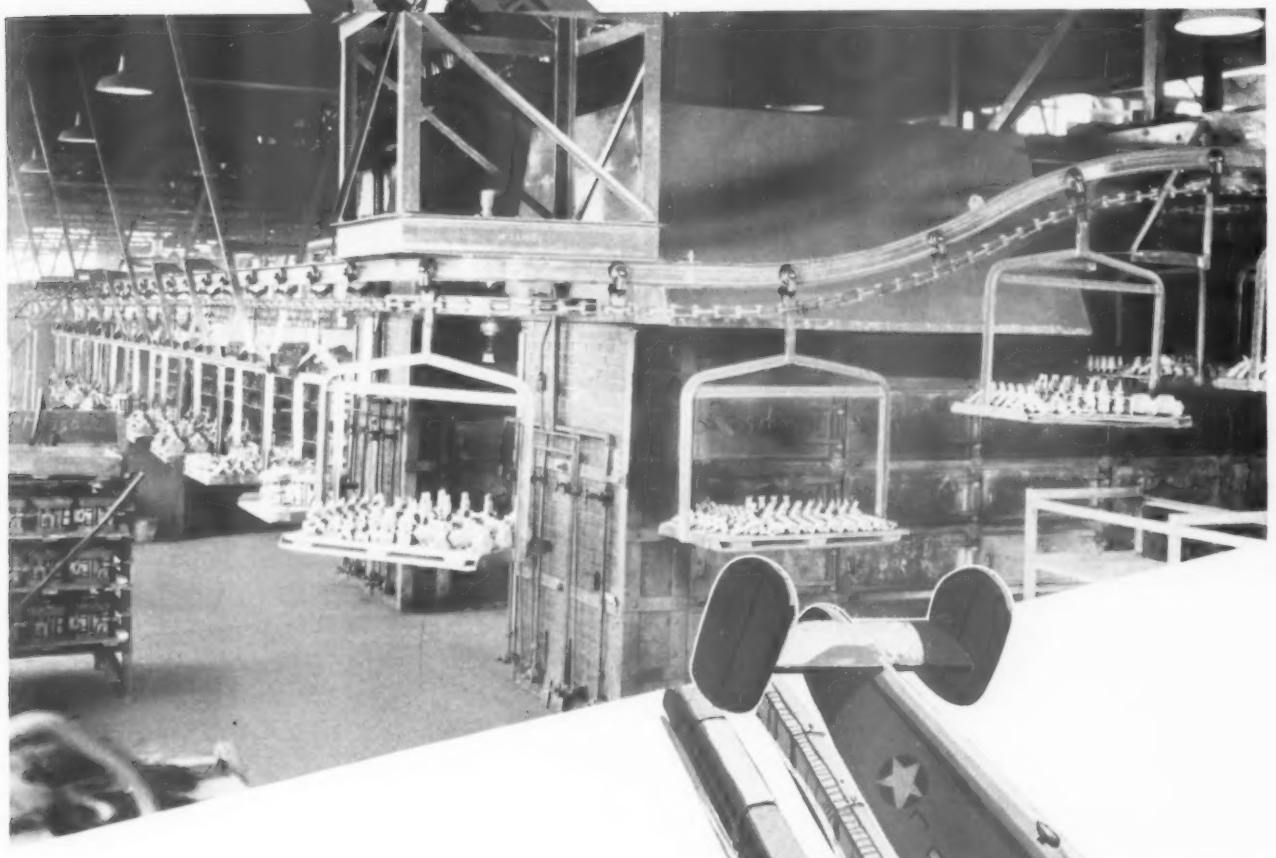

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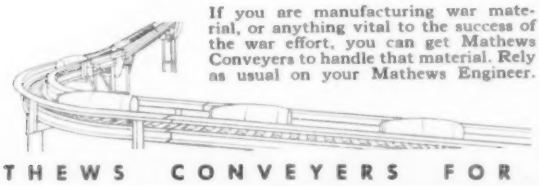

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(*Concluded from page* 120)

cible life averages 70-75 heats, and they are usually patched if necessary before each heat, using a plastic patch, a putty-like material with sillimanite base.

The furnaces are tilted as shown in an accompanying illustration to transfer metal either to two-man or single-man ladles, which are moved directly to the waiting molds on the track.

Development of the welding rod castings has been an interesting process. These rods are cast in ⅛, 3/16 and ¼-inch diameters, the ⅛-inch variety being 13 inches long and the other two 16 inches long. Molds are gated at one side and metal flows from the gate into a runner which feeds the series of rods flowing out from it. There are 29 rods on the ⅛-inch size, spaced about ¼-inch apart; 28 on the 3/16-inch and 25 on the ¼-inch. The ⅛-inch rod castings are made in a 12 x 16-inch flask, the others in a 13 x 18 flask. The trick in the castings is to persuade the metal to flow the full length of the horizontal mold. Early experiments resulted in rods only 3 or 4 inches long, but the technique was gradually improved to the point where now it is nearly always possible to obtain castings of the full specified length.

An illustration shows some samples of these rod castings as they come from the sand, along with some of the cast aluminum matchplates which are used in preparing the molds. These match plates were cast in the Gorham foundry. Molding sand is pure silica sand with 7 to 10 per cent bentonite bond, 3 per cent moisture. Sand is passed through a conventional type of muller and aerator, the latter operating at 500 revolutions per minute and discharging into a bucket on a car which is moved to one of five nearby molding benches. Old sand of course is reused, but generally new sand is used for facing, with a little sea coal facing material.

Molds are hand rammed with pneumatic tools, then stripped, assembled and clamped on the cars, with copes weighted down by heavy pieces of cast iron. One heat from a furnace will supply about 30 molds.

Foundry practice in general is geared to three guiding principles: 1. Proper control of sand and binder mixtures to avoid porosity; 2. Attention to gating and pouring practice to insure rapid solidification for proper grain structure; and 3. Uniformity of solidification to avoid stresses which might cause breakage or cooling cracks.

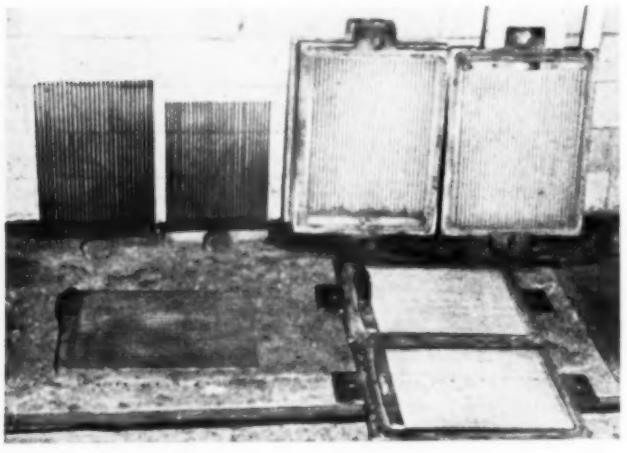
That these ends have been met to a nicety, particularly in connection with the small-diameter welding rods, is seen from the fact that the rods are sand-blasted and centerless ground, without requiring any annealing prior to use. One of the finished rods may be flexed measurably in the hand without damage, and when dropped on a hard surface gives out a ring suggestive of rolled material.

The welding rod steel runs about 1.15 per cent carbon, while a similar basic material used in tool blanks has somewhat lower carbon, around 0.85 per cent.

The latter material has been both sand cast and centrifugally cast in metal molds. Several arrangements for centrifugal casting have been tried. In one, the assembled mold was mounted on the headstock of a lathe and revolved while the molten metal was fed in through a pouring box and spout. In another the die was rotated on a vertical axis, the metal being fed in through a central gate, falling on a carbon insert in the lower half of the die and then flowing out radially into the mold cavities. Rotational speed varied from 400 to 600 revolutions per minute, depending upon the casting. Various cross sectional shapes have been cast and the mold grooves have been set both along the diameter of the mold or at an angle sharply inclined to the diameter, in the latter case the idea being that a greater centrifugal force would be applied to the metal if the mold grooves were, say, tangential to the pouring gate instead of normal to it. From 10 to 12 castings are produced in this type of radial centrifugal mold.

Unusual feature of the Gorham foundry is its cleanliness and neatness. The building itself is new, with ample light and good ceiling height. Walls are glazed tile, floor is concrete. Stores and raw materials are all kept in specially marked bins and containers, while the floor is swept regularly, molding sand kept in a neat pile to one side, and sand from the shakeout deposited on this pile. At one end of the building is the laboratory, pattern shop and offices. Wood patterns for hundreds of different tool shapes and forms are stored in neat racks and numbered for ready reference.

Typical mold and casting. These are a standard type of tool blank which will subsequently be annealed and machined



Three welding rod castings as they come from the sand shown at left of aluminum matchplates used in preparing molds for casting the rods

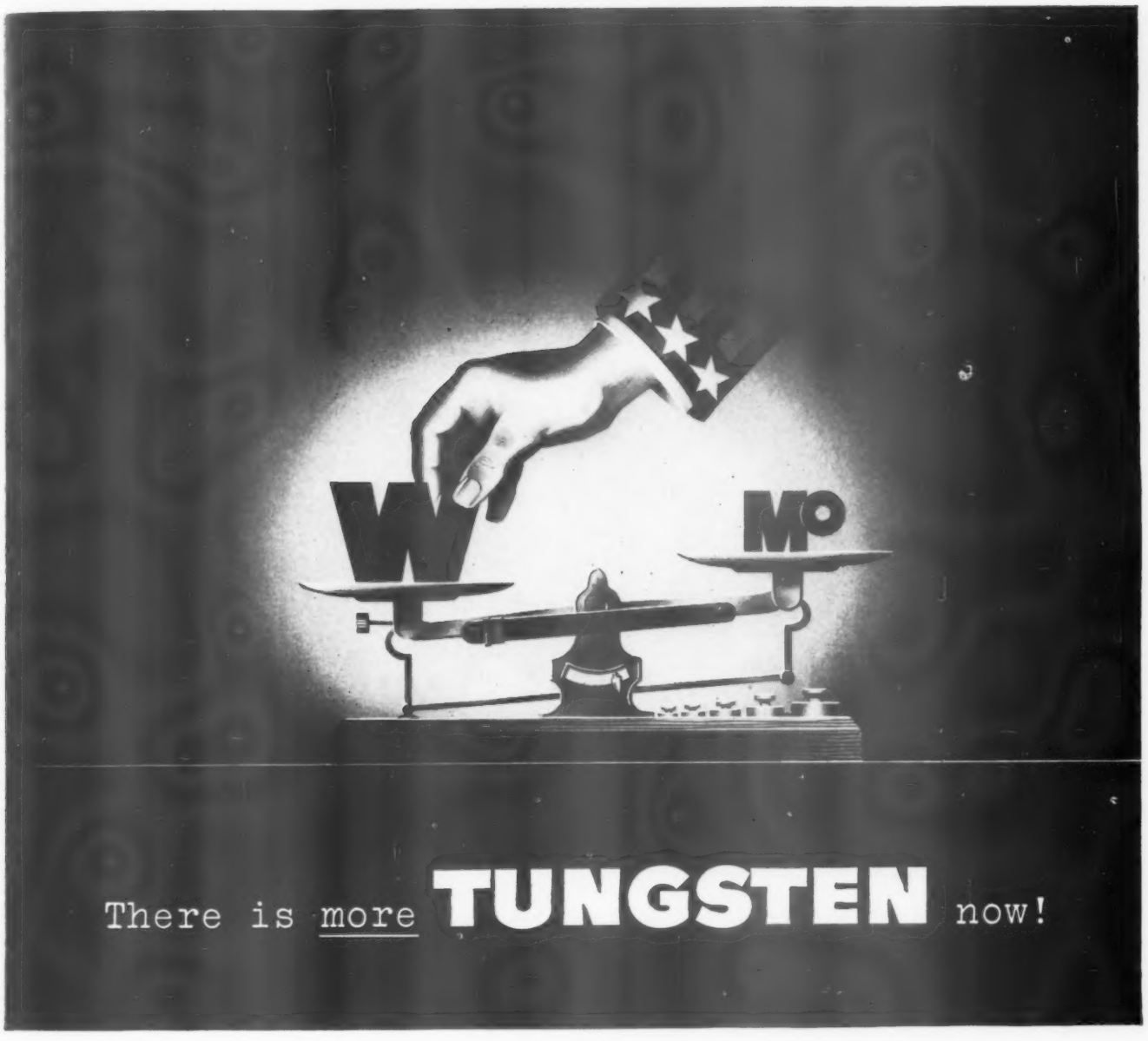
Starts Production of Magnesium Metal

Production of magnesium metal at the newly erected magnesium-chlorine plant in Louisiana has begun, according to an announcement by Mathieson Alkali Works Inc., the operating company. The plant is owned by the Defense Plant Corp. and has a future capacity of more than 50,000,000 pounds of magnesium metal a year.

Magnesium metal in this plant is manufactured by a new process developed by Mathieson engineers which produces not only pure magnesium metal but also liquid chlorine. It is estimated that this project when running at full production, will employ approximately 1000 workers to be recruited in the vicinity.

Tour Forms Firm

Sam Tour & Co. Inc., 65 Pine Street, New York, now is operating the metallurgical laboratories which formerly were a part of Lucius Pitkin Inc. The new firm will specialize in the metallurgical, chemical and process engineering fields. The metallurgical laboratory of the company is located at 45 Fulton Street, and includes equipment for melting, casting, heat treating, machining, testing, electroplating, welding, fabricating and examining metals. Associated with Mr. Tour in the new organization are Dr. E. I. Valyi, materials and process engineer; Alexander Gobus, chief metallurgist; Charles Davidoff and B. Mechanic, chemical engineers, and Edmund Silk, chief metallographer and radiographer.



Tungsten high-speed steel can be made and used in larger amounts according to a recent order of The War Production Board. The purpose is to economize available supplies of Molybdenum.

Now one element and now another is made scarce by the demands of war. Temporarily or for extended periods, use must be directed to alternative materials, in order to make inventories last or to let production catch up. The present W. P. B. ruling, an amendment to Order M-21-h, authorizes production and purchase of tungsten high-speed steels up to 35% of the total of such steels, as compared with 25% that was permitted before. This represents a 40% increase of the tungsten-type allowance. It is stipulated, however, that purchase of both tungsten and molybdenum steels must be for use within a stated time . . . unnecessary amounts of one must not be bought in order to get desired quantities of the other.

Thus Tungsten, which has always been important to the metallurgist, assumes even greater importance

Inquiries concerning any use of Tungsten, Boron, or Molybdenum, will be welcomed by The Molybdenum Corporation.

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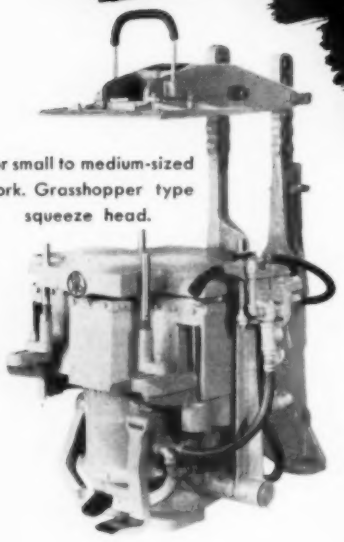

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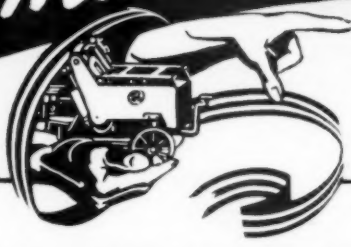

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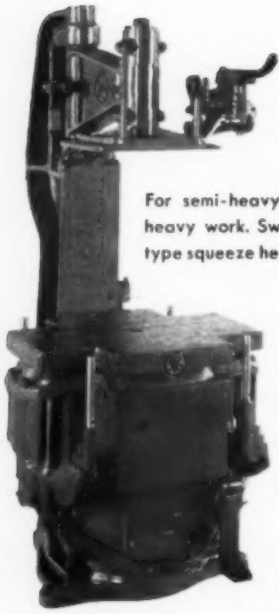

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Effect of Graphite Particle Size In the Inoculation of Gray Cast Iron

By HARRY R. DAHLBERG

INOCULATION of gray iron is a subject of increasing interest to foundrymen because it offers them a fairly reliable method of controlling the physical properties of their iron. The control of these physical properties has been attributed to the size and distribution of the graphite flakes.

In most cases expensive elements and alloys are used, such as ferrosilicon, zirconium silicide, calcium silicide, nickel, molybdenum and others. These are specifically elements which, when added to iron in increasing amounts, diminish the carbide stability which results in the precipitation of carbon from solution to the form of graphite.

This article was selected as the best paper submitted in the student engineering essay contest sponsored by the American Foundrymen's Association. The author, a student of the Engineering College, University of Minnesota, was awarded first prize during the recent annual meeting of the A.F.A. in St. Louis. Presentation of the paper is intended primarily as an incentive to students and apprentices in foundry work.

Some investigators have used the economical and readily available element graphite for the inoculant and have obtained good results. With this in mind, an investigation was started in the belief that the area of the inoculant in contact with the molten metal was important and would possibly offer some explanation of the mechanism of graphitization of inoculated gray iron for which no conclusive explanation has been given.

Many investigators used inoculants in such quantities as would change the chemical composition of the metal from which we would expect a change in the physical properties of the metal. However, variations in the behavior of the metal still persist when the chemical composition is held constant, and the less apparent factor of the inoculant's particle size is discussed in this paper.

The effects of superheating have been reported by various investigators[1,2,3,4]. They have shown that properties of certain irons are improved by superheating. These irons usually have a high total carbon with such alloying elements as nickel, molybdenum and chromium. The properties of low carbon irons are not improved and are often impaired when superheated. These investigations have led to several controversial theories on the graphitization of gray iron.

Piwowarsky[2] has furnished evidence supporting and undermining his graphite nuclei theory that nuclei of graphite or carbon is responsible for the precipitation of coarse graphite flakes. His evidence shows that superheating causes these graphite particles to go into solution with the iron at very high temperatures and consequently the nuclei are removed. This leads to the precipitation of fine graphite due to undercooling. He also showed that graphite dissolves very rapidly just above the liquidus.

The seeding effect suggested by Norbury and Morgan[5] supports the theory when they showed that an addition of 0.03 per cent flake graphite changed an iron that would normally be a fine "supercooled" graphite to an iron with coarse flakes.

DiGuilio and White[6] pointed out through their work that differences between "normal" and "abnormal" structures might be explained on the basis of presence or absence of graphite nuclei.

The "ferrous silicate slime" theory and the gas theory are feasible; however, the composition of the slime is too critical, and the lack of analytical methods in the gas theory make it impossible to furnish definite proof.

In the investigation on pouring temperatures of high test iron by Timmons and Crosby[4], they found that below 2650 degrees Fahr., strengths are reduced con-

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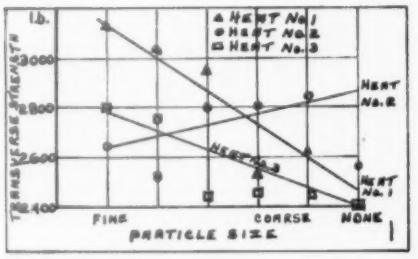

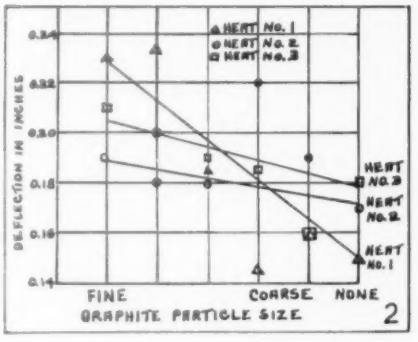

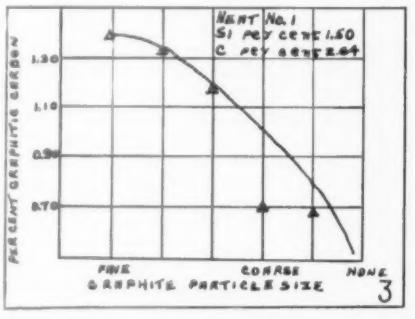

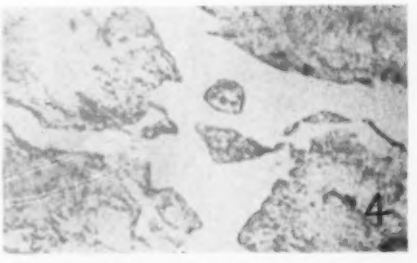

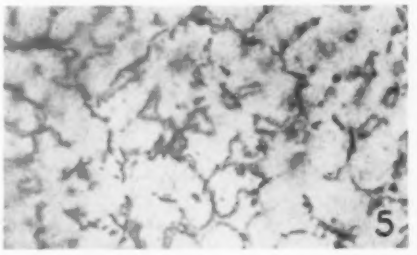

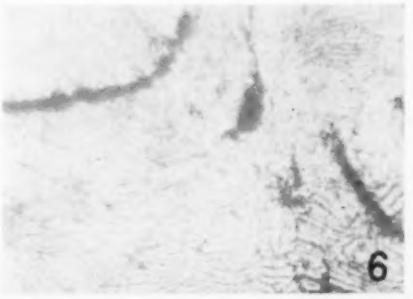

Fig. 1—Effect of particle size on transverse strength of low-silicon irons. Fig. 2—Effect of particle size on deflection properties. Fig. 3—Effect of particle size on graphitic carbon. Fig. 4—Microstructure at 100 diameters of specimen 11, showing pearlite surrounded by cementite. Fig. 5—Microstructure at 100 diameters of specimen 12, showing fine graphite flakes around primary austenite. Fig. 6—Microstructure of specimen 12, same as in Fig. 5, except at 1000 diameters, revealing graphite flakes surrounded by pearlite

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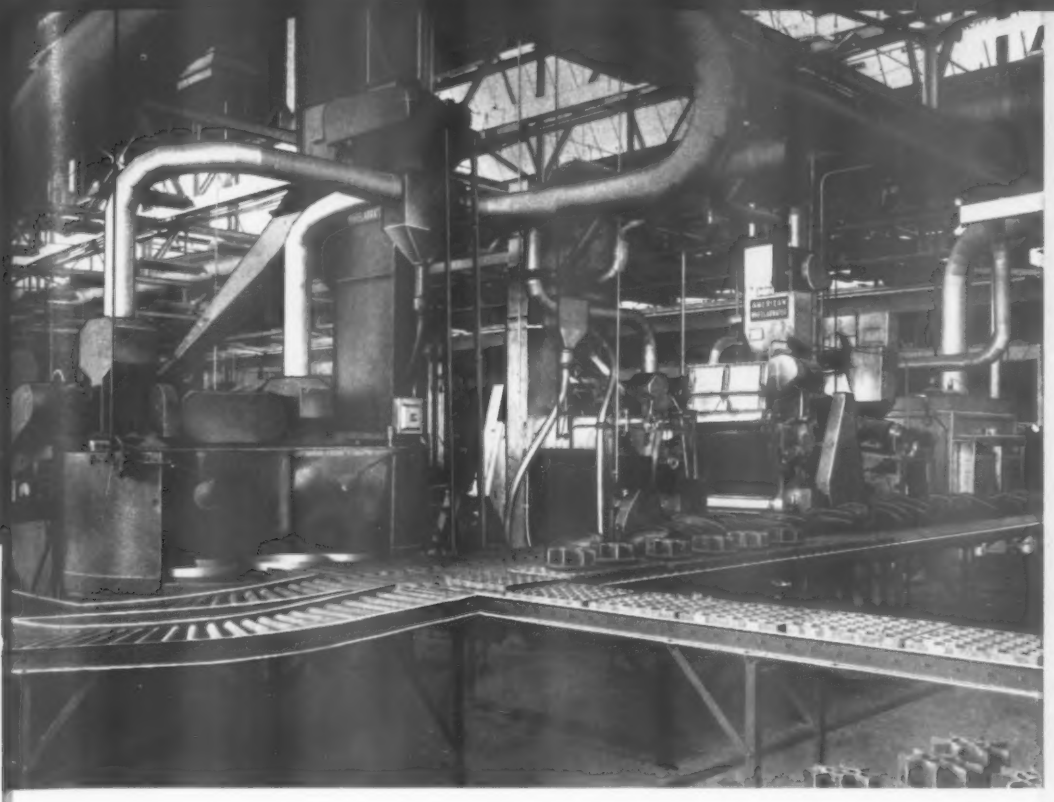

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(*Continued from page* 125)

siderably. Thus, throughout this investigation the pouring of test bars was done at that temperature.

The time required for the regular engineering curricula at the University of Minnesota made it impossible to conduct a comprehensive investigation on this phase of inoculation.

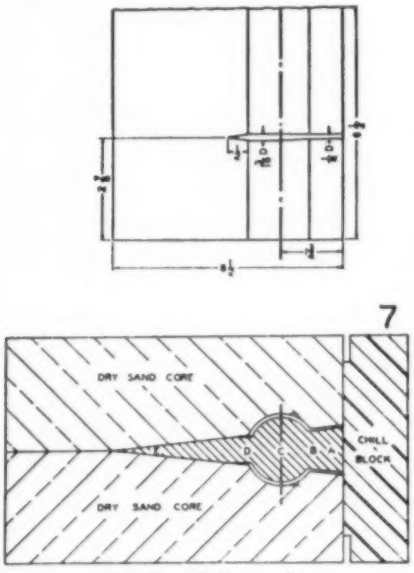

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Fig. 7—Chill test bar

Three 250-pound heats were cast using metal previously prepared from a cupola heat. The analysis of this metal was as follows: Carbon 3.31; silicon 1.80; manganese 0.46; sulphur 0.062; phosphorus 0.173. Steel scrap was used to decrease the total carbon of the heats, and silvery pig iron was used to obtain the desired silicon contents. Heat No. 1 consisted of 160 pounds of cast iron and 40 pounds of steel scrap; heat No. 2 included 160 pounds of cast iron, 40 pounds of steel scrap and 8 pounds of silvery pig iron (15 per cent silicon); heat No. 3 was made up of 160 pounds of cast iron, 40 pounds of steel scrap and 16 pounds of silvery pig iron.

A low carbon iron was used to obtain the high strength desired in the absence of alloying elements, and also to accentuate the effect of the inoculant.

Molds for transverse test bars and chill test bars were baked molds of core sand having the following composition by volume: 48 parts silica sand, 1 part linseed oil, and 2 parts water. When baked for four hours at 425 degrees Fahr., the mixture showed a permeability of 85 to 95. The vertical transverse test bar mold consisted of a double mold cavity, strainer cores, and pouring basin. The chill test bar is shown in Fig. 7.

The melting unit used was a Detroit electric, rocking, indirect-arc furnace. Melting control was difficult and temperature measurements with an optical pyrometer were discarded because of the inaccuracy due to smoke and fumes.

The metal was tapped into a 35-pound hand ladle, and the inoculant was added to the stream. Temperature at the time of inoculation was obtained with a tungsten-graphite thermocouple. The time between the inoculation and pouring of the test bars was recorded, pouring being done at 2650 degrees Fahr.

The temperature at inoculation was not constant because of the heat loss of the furnace, and it was not possible to hold the metal at a constant temperature throughout each heat even with the furnace in operation. This variable of inoculation temperature no doubt has affected the results of the investigation. Test bar data are shown in Table I on page 130.

The standard procedure outlined in the A.F.A. *Cast Metals Handbook* was followed in making the transverse and deflection tests. The bars that were machinable were later subjected to the tensile test. This data is shown in Table II on page 130.

The chill bars were broken and photographed, and are shown in Figs. 8, 9, and 10. The microstructure of each bar was checked and the average hardness determined on the polished specimens. Each bar was analyzed for total carbon, graphitic carbon, and silicon. These results are also shown in Table II.

The inoculant was commercial Mexican graphite, sizes used being 30 mesh, 8 mesh, ⅛-inch cubes, ¼-inch cubes and ½-inch cubes. The cubes were cut from graphite briquettes, and the 30 mesh and 8 mesh were sized by the suppliers.

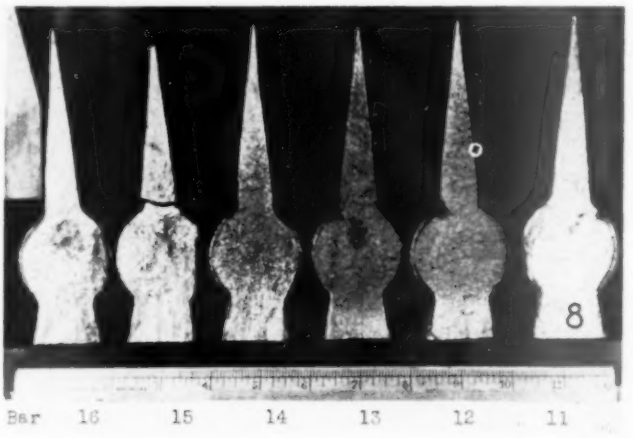
Twelve grams of each size were used for inoculating 35 pounds of iron. This small quantity was used to show that it would be the particle size of the inoculant rather than a change in chemical composition that caused the changes in the physical properties and microstructures of the iron.

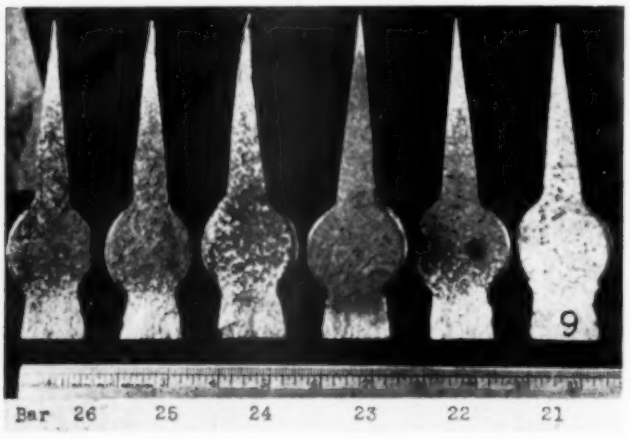
A study of the data in Table II indicates that the particle size of the graphite added has a decided effect on the transverse strength in irons of low silicon content. With an increase in the silicon content in heats Nos. 2 and 3 the slope of the curve changed; this indicates that the graphite particle size was not as critical as in heat No. 1. These curves are shown in Fig. 1. The deflection curves acted in a similar manner as shown in Fig. 2.

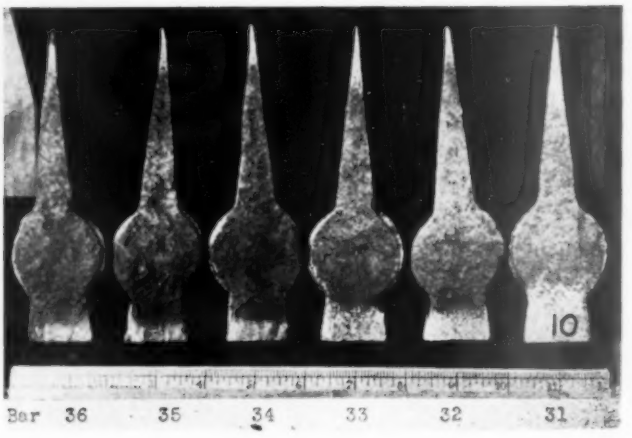
Table II further reveals that with low

(*Continued on page* 130)

Effect of particle size on chill depth in test bars. Fig. 8—Bars poured from heat No. 1. Fig. 9—Bars poured from heat No. 2. Fig. 10—Bars poured from heat No. 3







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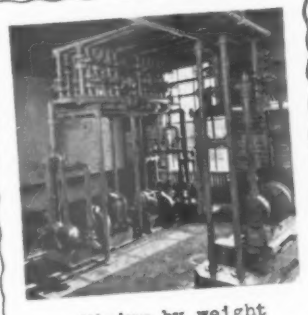

Mixing by weight

All American Foundries
1943 Victory Road
Anywhere, U. S. A.

Dear Andy:

Dumfounded I wa' th' nu to ken a beeg found-ree wi' muckle castings for ordnance still guessin' aboot a corrre bein' properrrly baked by its colorrr.

The superintendent had been telling me about the troubles they had been having with their cores, especially with gas in pouring. Of course, I put him right in the matter, as it has long been known to good core room men that the color of cores as they come from the oven is not by any means proof that they are properly baked.

Some dark-colored core oils contain a material which actually dyes the sand a dark brown. This leads to the belief that the cores are baked throughout before they really are, which results in excessive gas when pouring.

There are, of course, other causes for cores not being properly baked, which result in the splitting open of large cores during baking. In mentioning these, I also suggest the remedies which our experience dictates:

1. Low Permeability. Increase the grain size; reduce the cereal binder and clay content.
2. High Moisture. Less water will also assure smoother working in the core boxes.
3. Excessive Heat. Reduce heat and bake for longer period.

An ever-growing number of foundries from coast to coast are getting good, uniform cores at minimum cost by standardizing on the right grade of Certified core oil. There is no formula for a core oil which will give the best results in <u>all</u> foundries; which is why we insist that "core oils must be prescribed".

Now is a good time to get <u>your</u> prescription from the Core Oil Doctor. There's no cost or obligation. Just tell us fully about the shortcomings of your present core oil, your oil-to-sand ratio, type of sand used, your oven heat and what other binder you use.

Yours for bonnie cores,

Scotty Waugh

"The Core Oil Doctor"

CERTIFIED CORE OIL & MFG. CO.

"The House of Dependability"

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Table I—Laboratory Data

Test Bar No.	Graphite Size	Temp. at Inoculation, degrees Fahr.	Temp. at Pouring, degrees Fahr.	Time Diff. hrs. and min.
		Heat No. 1		
11	none	...	2680	...
12	30 mesh	2750	2660	1-32
13	8 mesh	2690	2660	1-0
14	⅛-in. cubes	2710	2652	1-13
15	¼-in. cubes	2780	2660	1-46
16	½-in. cubes	2870	2670	2-23
		Heat No. 2		
21	none	...	2660	...
22	30 mesh	2850	2660	2-44
23	8 mesh	2730	2652	2-8
24	⅛-in. cubes	2830	2652	2-56
25	¼-in. cubes	2740	2660	2-14
26	½-in. cubes	2840	2642	2-56
		Heat No. 3		
31	none	...	2660	...
32	30 mesh	2780	2598	2-12
33	8 mesh	2890	2660	3-7
34	⅛-in. cubes	2940	2660	4-31
35	¼-in. cubes	2800	2660	2-21
36	½-in. cubes	2770	2660	1-47

Table II—Chemical and Physical Data

Test Bar No.	Chemical Analysis, per cent: Total Carbon	Graphitic Carbon	Comb. Carbon	Silicon	Transverse Strength, lb.	Deflection, in.
11	2.64	0.11	2.53	1.52	2400	0.150
12	2.65	1.40	1.25	1.49	3150	0.230
13	2.66	1.35	1.31	1.53	3040	0.235
14	2.64	1.20	1.44	1.57	2925	0.185
15	2.66	0.71	1.95	1.56	2535	0.145
16	2.64	0.70	1.94	1.58	2610	0.160
21	2.62	1.83	0.79	2.27	2550	0.170
22	2.62	1.72	0.90	2.22	2650	0.190
23	2.64	1.69	0.95	2.19	2535	0.180
24	2.67	1.30	1.37	2.25	2800	0.180
25	2.63	1.70	0.93	2.21	2800	0.220
26	2.65	1.65	1.00	2.18	2840	0.190
31	2.64	1.91	0.73	3.04	2400	0.180
32	2.64	1.90	0.74	3.05	2800	0.210
33	2.64	1.85	0.79	3.07	2750	0.200
34	2.66	1.83	0.83	3.02	2435	0.190
35	2.62	1.87	0.75	3.11	2460	0.185
36	2.65	1.88	0.77	3.04	2450	0.160

(*Continued from page* 128)

silicon irons, the particle size has a pronounced effect on the graphitization produced by the inoculant. Above 2 per cent silicon, the graphitization is probably due to the silicon content rather than to the small amount of graphite used in the inoculation. This is shown in Fig. 3.

Information on the tensile strength of the specimens could not be included in this paper, because machining is still in process. It can be reported that specimens 11, 14, 15 and 16 are not machinable, and specimens 12 and 13 machine with difficulty. Specimens from heats Nos. 2 and 3 are machinable.

The effect of the particle size on the depth of chill is shown in Figs. 8, 9 and 10. In heats Nos. 1 and 2, 8-mesh graphite seems to offer the greatest reduction in chill. This did not hold true in heat No. 3 where the coarser particles produced the greatest reduction in chill. It is evident that such a small quantity of graphite does not give a great enough reduction in the depth of chill.

Microstructures of all specimens were found to be of the dendritic and eutectiform types. Photomicrographs of specimens 11 and 12 were taken to show the drastic effect of graphite inoculation.

In melting gray iron, equilibrium conditions are seldom obtained. The inoculation of molten gray iron probably accentuates this condition of unequilibrium. The microstructure of specimen 11 shown in Fig. 4 indicates that the base iron approached equilibrium and solidified in the meta-stable iron-iron carbide system. The microconstituents are primary austenite, which transformed to pearlite surrounded by cementite. Under higher magnification the cementite contained islands of ledeburite.

Specimen 12, shown in Fig. 5, probably solidified in the stable iron-graphite system. The presence of fine graphite flakes around the primary austenite indicates that the graphite popped out of solution while cooling between the liquidus and eutectic temperatures. The fine flakes are probably due to undercooling.

When specimen 12 was resolved at 1000 magnifications, shown in Fig. 6, the graphite flakes were surrounded by pearlite. If the iron had solidified in the metastable system, these flakes probably would have been surrounded by ferrite, a result of the decomposition of cementite. Therefore, the evidence indicates that the iron solidified in the stable iron-graphite system.

The data presented would lead to the following conclusions:

The graphite particle size in the inoculation of low-carbon, low-silicon irons has a decided effect on the transverse strength and deflection properties of the iron. When the silicon content is raised, this effect disappears.

The particle size also affects the graphitization of low-carbon, low-silicon irons. As the silicon content is increased, the graphitic carbon content becomes more or less constant. In these irons the graphitization can be attributed to the silicon content.

Eight-mesh graphite seems to offer the greatest reduction in the depth of chill. Perhaps a greater amount of inoculant is necessary.

The inoculation with graphite causes the iron to solidify in the stable iron-

(*Concluded on page* 146)

Link-Belt Receives "E" at Indianapolis

Ewart plant of Link-Belt Co. in Indianapolis now flies the Army-Navy "E" pennant, the award having been conferred before an audience of 6000 at ceremonies held June 17. Col. F. W. McMahon, chief, Cincinnati Ordnance District, is shown presenting the pennant to Frank S. O'Neil, Link-Belt vice president and general manager of Indianapolis plant operations. "E" pins were accepted on behalf of the employes by Walter Craigle, president, Link-Belt Local No. 1150

Opens Branch Office

Frederic B. Stevens Inc., Detroit, has opened a branch office at room 1123 Fidelity building, 1940 East Sixth Street, Cleveland. The branch was added so that the company may give more efficient service to the manufacturers in the Cleveland district. The foundry supply and equipment department of the business will be in charge of Frank J. Balsley and the department handling buffing and deburring compositions, metal finishers and electroplaters supplies and equipment will be handled by Charles H. Stoddard.

Information supplied by an Industrial Publication

Several means are being applied industrially to save time and reduce fatigue of welders working on heavy jobs. Positioning tables, rotating jigs and similar devices for handling heavy or bulky assemblies are quite generally used.

One aircraft manufacturer has adopted a similar idea for welders working on small sub-assemblies. The assemblies are light, and joints are usually quite accessible. But moving the assemblies by hand does occasion some delay.

This is obviated by mounting the work on a small turn table somewhat resembling an old style potter's wheel. The turn table is quite simple, consisting of two round plates mounted on a common shaft.

The upper plate carries the work, and is located at a convenient height above a work table. The lower plate is a few inches above the shop floor. It is positioned so that the operator's feet rest on it comfortably.

Thus, when the operator wishes to move the work, he simply "indexes" the lower table by foot power. The weight of his feet on the plate is, however, sufficient to hold the whole turn table steady while he is welding any particular joint.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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MOLY

the adventures of BILL

BY PAT DWYER

Drawings By RICHEY

SOMETIMES," Bill remarked wistfully the other night, "I wish I had devoted more time to the fine art of writing letters. I should like to be able to spread the words as smooth and slick as a dose of goosegrease flowing through a tin horn, but concealing a nice assortment of sharp needle points designed to remind the recipient that all was not quiet on the Western Front."

"Why the hostile, porcupine attitude?" I inquired. "Has some honest gent inadvertently stepped on your tail, siphoned 4 gallons of gas out of your car tank, cheated you at a little friendly round of golf, poker or craps, or sneaked in ahead of you in one of the ration lines. With the mercury in the thermometer threatening to pop out of the top one of these days, you should cultivate the calm, serene state of mind, the old sang froid. Dash it all man, have some regard for the blood pressure. Suppose you blow a fuse or a gasket or something, just think of the pickle I would be in when the doctor and the undertaker and the coroner come around asking me all kinds of nosey and impertinent questions."

"Then," said Bill, "you will be in the same position I am in now. Then you will forget all about the pressure and the fuses and the gaskets. Then you will crave a bushel basketful of the good old words that, as the feller says, bite like an adder and sting like a serpent. I am as neighborly as the next fellow. Always ready with the cheery word and the civil answer when a fellow citizen asks me a legitimate question. However, when the aforesaid citizen backs me into a corner or holds me up in any other place and expects me to supply a 10 or 12 word answer to a $64 question, I want to call out the marines and do a little gory mopping up."

"This begins to look serious. The cloud no bigger than a man's hand and so forth. Before going any deeper into the subject, before throwing the undoubted weight of my influence in either side of the scale, or to put it bluntly before I take up arms for or against you, just tell me one thing. Do you know the answer to this hypothetical $64 question? That really is the touch stone by which one may judge whether you have a grievance, or are merely blowing off steam through a leaky safety valve."

"Hypothetical question," sez he. "Just throw your little weasel eyes over this precious message written on the official note paper of Ookums, Snookums, Didymus and Moriarity; Barristers, Attorneys at Law, etc., etc.:

Sir: I have recently been appointed an arbiter in a dispute between the employes and the management of a certain industrial establishment in this city engaged in the production of metal castings. The situation is new and strange to me. Can you refer me to any brief publication that shows the classification of employes, nature of their duties, standard compensation, description of foundry operations, materials and equipment, and a complete list of foundry terms. Total unfamiliarity with these various items makes it extremely difficult for me to appraise the merits of the claims advanced by the parties of the first and second parts, or to arrive at a fair and equitable decision.

"No use," said Bill, "trying to read the signature. The beginning, on a miniature scale, bears a strong resemblance to the giant squid which figures so prominently in the cinema version of *Reap The Wild Wind*. Offhand I should say that in actual comparison the signature has a slight edge in the number of coils and curlicues, but of course that may be an optical delusion. The remainder of the signature would remind you of one of these here now long hairy caterpillars that move along in a series of riffles, easy enough to contemplate on the ground, but perfectly horrible inside the open neck of a sport shirt. They drop off trees."

He is not writing a love letter

"Just to keep the record straight, who or what drops off trees? Squids, signatures or caterpillars? All you have to do to avoid these droppers-in-to-see-you-some-time, is to stay away from the trees. In a general way also I should say that would be a good plan to adopt with letters from Ookums, Snookums, Didymus and Moriar-y-tee.

"Well," said Bill, "I'll tell you. The calm assumption on the part of many outsiders that the foundry business is so simple and elementary, that a man can learn it from a book in an hour or two, always touches me on a tender nerve. Every foundryman knows that many years of actual experience, hard study and serious thinking are required to familiarize a man with the broad general principles and operating details. The foundry is a highly intricate, highly involved and highly specialized business. Ramifications extend into many channels, finance, economics, merchandizing, jurisprudence, hygiene, sociology, labor relations, besides the purely technical features of making the molds and melting the metal. The modern foundryman must have initiative, tact and vision and must be capable, aggressive and ambitious. Above all he must have a generous measure of what is perhaps the rarest of all virtues, known for want of a better or more high sounding name, as plain business or horse sense."

"Come, come, my dear fellow. Seems to me you are piling it on a bit thick. In the foregoing enumeration you omitted to include the beautiful virtue of modesty, an outstanding characteristic of all true master foundrymen. Publication of your opinion would cause foundrymen from Maine to Cal-i-for-ny-a to blush up to their hairy ears."

"Certainly," Bill agreed cheerfully, "modesty is a characteristic of a good foundryman. That fact is so well known and so self evident that I saw no reason for touching upon it.

"Foundrymen who through study and experience attain positions of authority and responsibility, know as much and probably in some instances know more about their own specialty than many men in the so-called learned professions know about their's.

"You would not catch a foundryman accepting a position as umpire in a dispute involving highly intimate and technical features, legal, theological, financial or medicinal. He would admit that

(*Concluded on page* 135)

Simple hand pushed equipment makes up efficient charging system.

Unloading crane ties in with plant storage area.

Racks handle finished parts through drying ovens.

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American MonoRail Equipment offers versatile application without costly adjustment or lengthy engineering.

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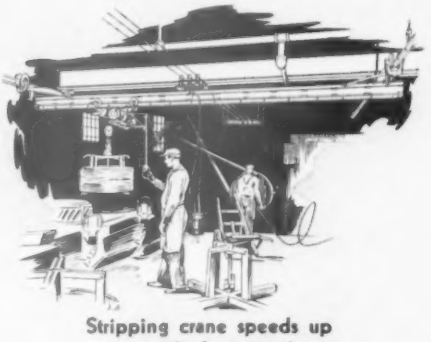

Stripping crane speeds up removal of wire coils.

Crane over storage area moves steel easily.

THE AMERICAN MONORAIL CO.

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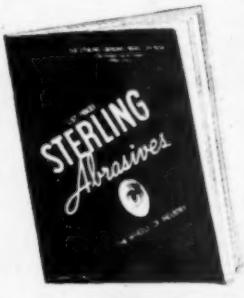
INDUSTRIAL strategy today helps back up the planning of our men on the fighting fronts. Only through the assurance of steady, prompt delivery of supplies can Army and Navy men plan for victory. One break in our production lines can disrupt battle plans . . . means disasterous defeat on land or sea!

Upon the energy of every workman and the high quality of the guns, tanks, and airplanes they make, depends the quick coming of victory. The manufacture of proper machines to do the work here at home, and the creation of efficient war material for use abroad is sometimes limited by the quality of the grinding wheels that are used.



Ways to add to the speed of your grinding are outlined in Catalog No. 43, just off the press. May we send it?

If a grinding wheel has been built for the job, it will last longer and turn out work faster. If the wheel be inefficient, the job suffers! Sterling Grinding Wheels, built to perform accurately and efficiently on your jobs, are a mighty factor in turning out the machines and tools of production and war.

"This is a grinding war," says a well known authority. Since grinding wheels are so important to speedy, accurate production, we welcome the opportunity to cooperate with you. Sterling engineers, experienced on hundreds of wartime grinding jobs, are ready to call upon request. May we show you how the "Wheels of Industry" can solve your problems?

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

(*Concluded from page* 132)

he was not qualified. Members of the learned professions have no scruples of that kind. Apparently they are firmly convinced that the conferring of a degree in some miraculous manner has converted them into walking encyclopedias endowed with the distilled essence of all the wisdom accumulated by man since the world began. Look at this one-fourth representative of O, O, D. & M. He calmly admits that he knows nothing about the foundry. And yet he is quite confident he can arrive at a just decision in a case where all the evidence, so far as he is concerned, is so much Greek or Choctaw. Sometimes I wonder who is most to blame, men who accept positions for which they are not qualified, or the people who elect or appoint them.

"Reminds me of a judge who flourished down East one time and who, according to a witty member of the bar, was a portly, pompous major planet whose exalted opinion of himself was not shared by those who unfortunately came within his orbit. He was an honest, upright old scout, good to his mother and all that kind of thing, but his knowledge of the law, and for that matter, any other subject, never would qualify him for a niche in the Hall of Fame. At stated periods, say once or twice a year he rode the circuit of small communities which were not of sufficient size or importance to maintain a resident judge. Petty criminals charged with minor infractions of the law remained out on bail for months and pursued their usual avocations, pending the arrival of the judge. Plaintiffs and defendants in suits over boundary lines, livestock, rum running and other activities exchanged bitter and uncomplimentary references, indulged in rude and vulgar gestures and in some instances before court day arrived, laid the foundation for feuds that lasted for generations. I remember a case where a young man was accused of stealing a pig."

"I know all about him," I said. "Tom, Tom, the piper's son. Let him go and come back to the judge."

"You have the bird's name wrong. His name was Hugh Archie. After he was acquitted of stealing the pig, he came back later and stole the farmer's daughter. As a matter of fact of course she was quite willing to be stolen. Otherwise all the king's horses and all the king's men could not have dragged her out of her father's house. Seems to me a nice point in ethics is involved in a case of that kind. Was Hugh Archie guilty of a crime in taking a party who wanted to be taken? On the other hand if the law nipped him by the heels, would he be charged with grand or petty larceny?"

"Decision," I said, "would depend on the general size and heft of the loot. Offhand I should say that stealing a good, husky, stall-fed, Percheron type specimen, 200 pounds on the hoof, quite properly might be termed grand larceny. At the other extreme, lifting a 65-pound bundle of fluff, feathers, curls, rouge and lip stick might be termed petty larceny —and an error of judgment. How did your judge handle that hot potato?"

"He did not have to handle it. Hugh Archie and the bride skipped off to Boston where Hughie got a job as motorman on the Elevated, and so far as we are concerned, rode out of this story. What I had in mind was another episode in the career of the eminent jurist.

"One day Dennis O'Rourke, a personable young lad from Erin's Isle, on a bit of tour of North America arrived in Gooseville, the quaintly named town where the judge was scheduled to hold court the following day. Inquiring around for a stopping place Dennis was fortunate enough to fall in with the alert editor of the *Weekly Bugle*. This enterprising citizen directed him to the establishment of the widow McTavish:

Tourists
With Running Water
Home Cooked Meals
and
Free Parking In Rear

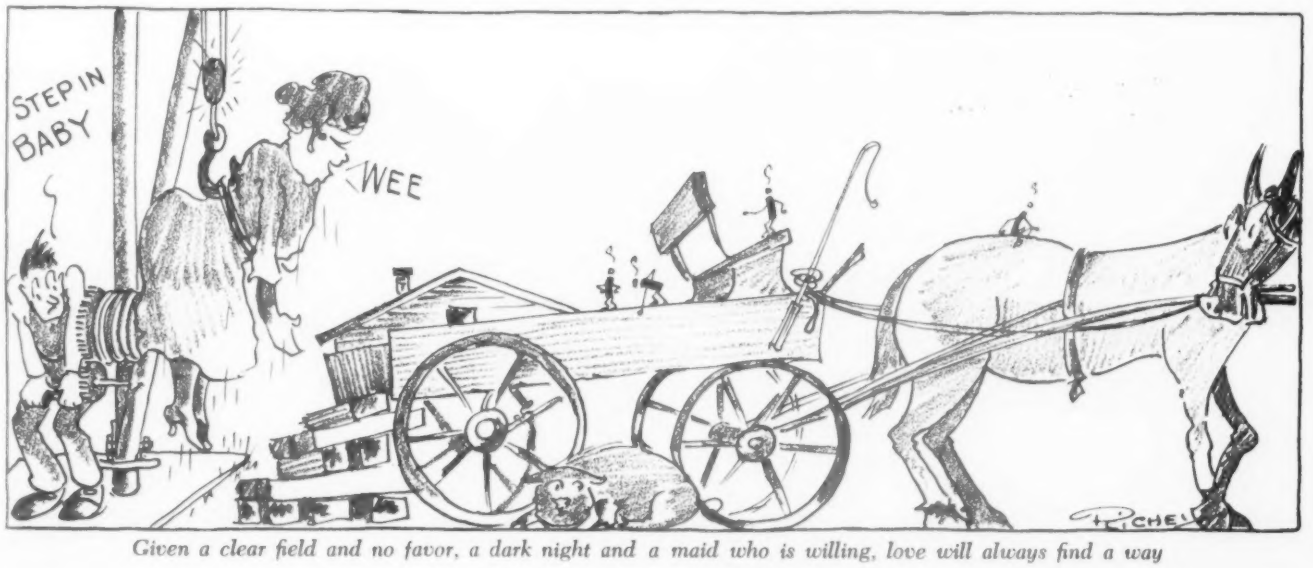
"The widow was sorry. She only had one vacant room and that was the room the judge always occupied when he came to town. However, the room had two beds. The judge was a very amiable gentleman. There was a possibility—mind you she promised nothing—but there was a possibility that if Mr. O'Rourke met the judge and made a favorable impression, why the judge might agree to share the room for the night.

"The interview was quite satisfactory. The judge unbent and in hearty man-to-man fashion said it would be a pleasure to extend what hospitality lay in his power to a young man who was—er—no doubt engaged in a worthy mission to this fair land of—ah—practically unlimited distances and—ah—magnificent resources and—ah—if he might say so with becoming modesty, a legal system that was rigorously enforced Sir—ah—yes, rigorously enforced.

"They had dinner together and then retired to their room where the judge brought out a pack of cards, a handful of cigars and a bottle of liquor smuggled in from St. Pierre. They talked of many things and Dennis soon discovered that—as my old Uncle Malachi used to say—all the judge's stock was in the front window. Nothing on the counter or on the shelves. Comparing the social systems in the old and in the new land, the judge condemned a system which rigidly confined the people to the strata or class in which they happened to be born. Every man, as in our favored land, should have the opportunity to rise in the social scale to the limit of his ability.

"Shortly after they had tumbled into bed the judge commenced to chuckle. Dennis inquired politely for the cause. 'I was just thinking O'Rourke,' said His Honor, 'that you would be a long time in Ireland before you would be allowed to sleep in the same room with a judge.'

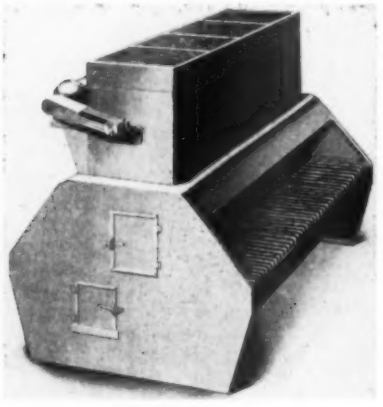
" 'Well, you know Judge,' says Dennis, 'I was just doing a bit of thinking myself. I was thinking you would be a hell of a long time in Ireland before they'd make a judge out of you!' "



Given a clear field and no favor, a dark night and a maid who is willing, love will always find a way

Work Bench

Claude B. Schneible Co., 3953 Lawrence Avenue, Chicago, has developed a new ventilated work bench for removing dust from such operations as grinding, filing, chipping, etc. It is available in single and double-size models, and in any one of four arrangements. Model illustrated accommodates workers on either side, with working surfaces 10 feet long and 30 inches wide. Grating can be hardwood or steel. Air is drawn over the work by fans in the top of the air-washing section, driving dust particles against a set wall in the back of the bench or the wet panel below the grate,



and washed downward into the tank below. Dust is also picked up by the indrawn air and carried downward through the grates into the dust chamber, where it is impinged on the wet surfaces. Collector units within the bench wash the air and discharge it into the room through a filter. Solids are removed from the settling tank through doors at either end of the unit. Water, oil or other liquid used as the cleaning medium is circulated by a vertical centrifugal pump and may be reused.

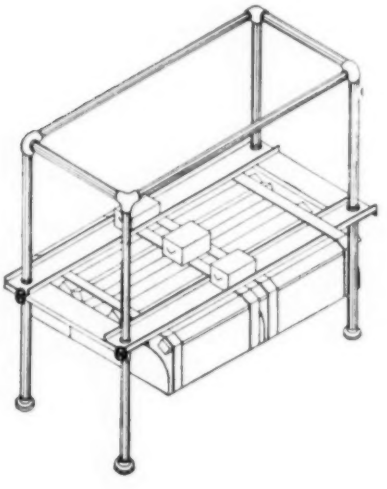
Abrasive Points

Abrasive Co., Tacony and Fraley Streets, Philadelphia (37), announces a new type of abrasive mounted wheels and mounted points having demountable spindles which can be removed and reused on other points. A threaded porcelain bushing is inserted in and fused to the abrasive wheel mass. The spindle screws into the porcelain bushing and

need not be removed from the grinder chuck or head in changing points. Product is made in standard grain and grade combinations in vitrified bonded wheels or points. Demountable spindle size is limited to ¼-inch diameter by 1¼-inch length.

Mold Drier

Infra-Red Engineers Inc., 812 Huron Road, Cleveland, is offering a portable unit for skin drying green sand molds by infra-red heat. Use of the equipment is said to result in savings in time, labor, floor space and drying costs. Average time for drying to a 1½-inch depth is 90 minutes; power consumption to dry a mold 21 x 11 inches to this depth is 1½ kilowatts, and for a mold 46 x 36 inches consumption is 9 kilowatts. Unit



illustrated weighs 180 pounds, handles molds up to 46 inches long, 36 inches wide and 36 inches high. Heater assembly is wired in six sections, each section being individually controlled by switches to permit drying of small molds without heating the entire unit. Assembly may be raised or lowered as required. Each of the six heater units is equipped with four 250-watt infra red lamps. Horizontal bars provided on each of two sides of the drier permit it to be carried by two men.

Lifting Magnet

Stearns Magnetic Mfg. Co., 662 South Twenty-Eighth Street, Milwaukee, announces a complete line of lifting magnets to supplement its existing magnetic equipment. Circular lifting magnets are

available in seven sizes ranging from 20 to 65 inches in diameter, the largest size being shown in the accompanying illustration. Features include renewable pole shoes of alloy steel; ribbed coil shield; unicoil construction; high heat dissipation; ample coil weight support; protection for leads and terminals against damage and shock; accessibility of inspection without disturbing the permanently sealed insulation; and impregnated windings to eliminate electrical trouble and provide waterproof construction.

Liquid Filter

Staynew Filter Corp., 36 Centre Park, Rochester, N. Y., has applied its radial fin construction for various types of filters to a new sump-type liquid filter. It is designed for use wherever dirty liquids are collected, filtered, and re-circulated. Filter medium is preformed in a radial fin shape and slips over a heavy similarly shaped mesh supporting form. Design permits expansion of the insert like a bellows so that accumulated material may

(*Continued on page* 138)

Handy Help FOR BUSY FOUNDRYMEN

SEND FOR THIS *NEW* CONDENSED CATALOG

★ Illustrates and describes *briefly* tumbling mills, blast tables, blast mills, blast rooms, airless blast cleaning, dust filters and other modern Sly equipment.

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Please send me the new SLY CONDENSED CATALOG

Name _____ (title) _____

Address _____

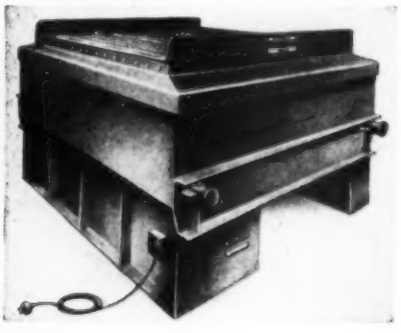
(*Continued from page* 136)
be washed or brushed off quickly. Consisting of only four major parts, unit may be dismantled without removal from pump suction line. It is available in seven models for pipe diameters of ½-inch to 2 inches.

Floor Material

Flexrock Co., 2300 Manning Street, Philadelphia (3), announces a new industrial floor product said to offer greater resistance to penetration of acid, water, oil and grease, at the same time being durable, smooth and dustless. It is recommended for new floors; for overlays on concrete, brick, stone or wood, and for repairing and resurfacing areas of any size.

Portable Shakeout

Robins Conveyors Inc., Passaic, N. J., announces a new portable foundry shakeout which eliminates need of permanent foundation or hopper and mechanical sand-remover. It can be located at any convenient spot by means of a crane and can be removed to any accessible space when idle, or at night. If desired, deck-surface can be sloped to discharge



castings or other retained material automatically into tote boxes or onto a separate pile. Entire vibrated frame is supported on coil springs, and the shakeout can be mounted on portable supports. It is made in standard sizes from 2 x 4 feet (for 1 ton or less) to 6 x 10 feet for 17-ton capacity. Model illustrated is 6 x 6 feet for 9-ton capacity.

Tracing Cloth

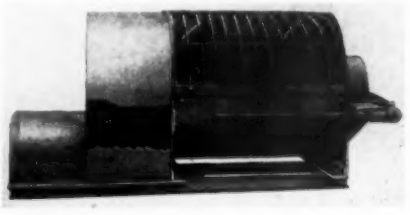
Frederick Post Co., Hamlin and Avondale Avenues, Chicago, has developed a new type of white pencil tracing cloth. Principal features include moisture resistance on both sides, and a fine-tooth surface which leaves a sharp, black image from pencil lines.

Vapor Cleaner

Circo Products Co., 2835 Chester Avenue, Cleveland, is offering its vapor cleaner unit for internal degreasing of machinery gear cases and enclosed transmissions, oil reservoirs and lines, heat exchangers, etc. Electrically heated, it uses a solvent which, when heated, creates a constant flow of vapors at a temperature of 250 to 275 degrees Fahr. into the housing being treated. Upon striking metal the vapor condenses and washes down particles of foreign matter. All moisture due to condensation is completely removed, and parts and housing are left perfectly dry and clean.

Sand Mixer

Freeman Supply Co., 1152 East Broadway, Toledo, O., is offering its new foundry mixer in a full range of sizes from 3 to 60 cubic feet. Radial thrust ball bearings on the paddle shaft are



located outside the drum, with seals preventing sand from working out of either end of the drum. Drum liner is replaceable. Discharge door may be located at either end or back of the mixer. Blades are made of heavy steel plate and assembled on the shaft in opposed pairs, so that two blades turn the same sand with each revolution. More than the usual number of blades is said to be provided. Mixer is designed for operation by V-belt drive, flat belt drive or geared head drive.

Goggle

Watchemoket Optical Co., Providence, R. I., is offering a new, all-plastic goggle. Employing plexiglas for the lenses, the goggle fits directly over prescription glasses, and the full frame gives added protection against injury from sides, top and bottom. Lenses can be removed for

cleaning or replacement. Frame is reinforced with a metal clip at the bridge and is ventilated to prevent fogging. It weighs 1¾ ounces. Snap-in filters are available for welding, torch cutting and other glares.

Medical Cabinet

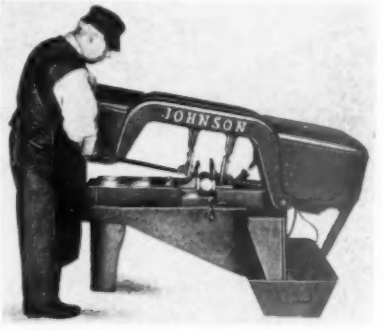
J. E. Erback Co., 15 East Twenty-Sixth Street, New York, is offering portable medical cabinets intended to be used in plants for first-aid purposes to supplement centralized dispensary facilities. It is mounted on ball-bearing casters and readily managed by one person. When not in use it requires little floor space, but when opened gives a large working area. Space is provided for essential medical accessories.

Dermatosis Cream

Tarbonis Co., 1220 Huron Road, Cleveland, is offering a cream said to be particularly effective in preventing industrial dermatosis. It is recommended where occupational dermatosis is due to chemical irritation, chronic exposure to abrasives, work with cutting oils, reagents, acids, etc. Cream is greaseless, clinically non-allergic and non-irritating.

Metal Saw

Johnson Mfg. Corp., Albion, Mich., has developed a wet cutting model of its metal saw. Pump is non-clogging piston type, driven by noiseless cam, its speed being automatically regulated by



speed of the machine and its power derived from the drive gear. A ram insures steady flow of coolant. Pump may be readily disconnected if dry cutting is desired, and Johnson saws now in use may be equipped with this coolant feature.

Induction Motor

Lima Electric Motor Co., Lima, O., is offering a drip-proof electric induction motor in sizes from ½ to 75 horsepower, 2 or 3 phase current. It is designed to give maximum protection against chips and filings, dripping or splashing liquids. Includes heavy duty ball bearings, heat treated ground shaft, dynamically balanced rotor and heavy frame. Phase insulation is heavy varnished duck.

Vibration Machine

All American Tool & Mfg. Co., 1020 Fullerton Parkway, Chicago, has developed a new model vibration fatigue testing machine. It will handle parts or

(*Continued on page* 140)

SOMETHING NEW!
. . . low temperature Baking Oils specially manufactured for magnesium castings . . . bake out at 350°. Write for samples and full information!

Proven! FEWER REJECTS

WHEN YOU USE VELSICOL *CORE OIL*

High Tensile Strength
Rapid Collapsibility
Uniform High Quality

No matter what type of metal poured, Velsicol Resin Modified Core Oil can improve your castings. It has the core strength needed and yet collapses so rapidly that it's a "natural" for speed-up war-time production—especially on aluminum and magnesium castings.

Prove it to yourself! Make the Velsicol Core Oil test in your foundry—now—and be assured of its superior qualities . . . of its high tensile strength which is an important feature of any core oil . . . of its uniform high quality that will help to eliminate errors caused by shrinkage and expansion!

If you want better castings, act today! Adequate plant facilities assure you of an uninterrupted supply of this Resin Modified Core Oil.

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VELSICOL *Corporation*

GENERAL OFFICES: 120 EAST PEARSON STREET, CHICAGO

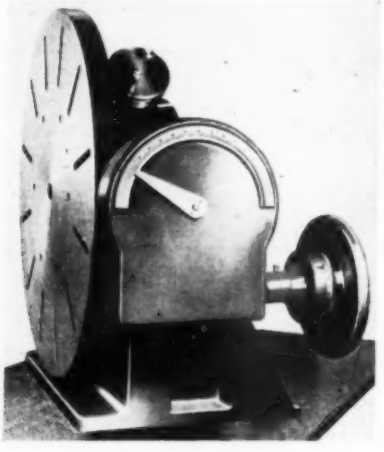
VELSICOL

PLANT: MARSHALL, ILLINOIS

(*Continued from page* 138)
assemblies up to 100 pounds, the table measuring 15 x 18 inches. Range of vibration is from 600 to 3600 a minute, recorded on an electric tachometer. Displacement, from 0 to .125-inch (adjustable), covers the full range encountered by parts subjected to vibration in actual service. Maximum capacity is 23g. Base area of the unit is 24 x 42 inches. Weight is 550 pounds. A 1½-horsepower motor supplies power.

Measuring Device

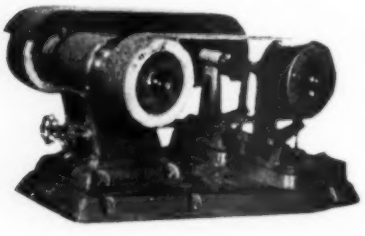
Machine Products Corp., 6771 East McNichols Street, Detroit, has developed a device for measuring large objects such as fixtures, castings, patterns, or fabri-



cated parts, as well as for use as a holding fixture for boring mill setups. It has a 36-inch circular table on which work to be measured may be clamped. Without disturbing the original clamping, an inspector can measure all angles on the work. By means of geared turning wheels the table can be rotated to any degree and to any angle from the vertical to the horizontal and then 30 degrees below in the opposite direction. Dials register angle of setting. An auxiliary table, 18⅞ inches in diameter, is available if needed for smaller work. Unit weighs 1400 pounds; overall height is 27⅝ inches, and base measures 20½ x 27⅛ inches.

Bench Grinder

Jones Engineering Co., Ellwood City, Pa., has added a new bench grinder and



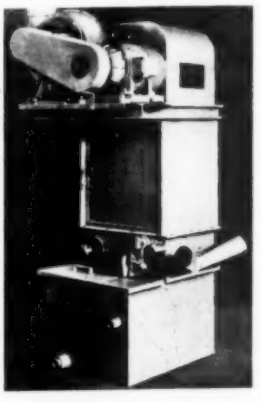
polishing machine to its line of abrasive belt grinding equipment. It is designed for production work in deburring, grinding and finishing flat or irregular-shaped parts. It is mounted on a one-piece base, with belt tension maintained by an adjustable spring device on the idler pulley. Any ¾ to 2 horsepower motor may be used mounted underneath the bench. Machine is equipped with a patented, cushioned, segment face contact wheel; uses factory-coated abrasive belts, and has a rubber contact roll.

Lift Truck

Baker Industrial Truck Division, the Baker-Raulang Co., 2168 West Twenty-Fifth Street, Cleveland, is introducing a new 4000-pound capacity low-lift truck designed to give longer hours of uninterrupted operation and to provide better vision to the operator. It has a 66-inch wheelbase and overall length of 123¾ inches, permitting right angle turns in aisles 67 inches wide. Battery box has been enlarged to provide additional battery capacity. Better visibility is provided the operator by chamfering top corners of the battery compartment. Operator's guard is built integral with the frame.

Dust Collector

Industrial Equipment Corp., 625 East Forest Avenue, Detroit, has added a small unit to its line of orifice-type collectors. It has a capacity of 1200 cubic feet per minute and has been designed especially to meet requirement of double spindle grinding and buffing lathes, although it is adaptable to other kinds of work. Unit is said to be particularly



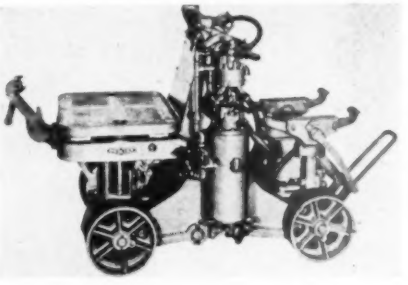
effective in connection with magnesium. Cleaning action is caused by the movement of air through an orifice. Compartment at the side collects the sludge and permits its easy removal. Water level is controlled by a specially constructed diaphragm.

Calibration Plate

Harnischfeger Corp., 4400 West National Avenue, Milwaukee, announces a new direct current welder calibration plate claimed to give exactly the right heat across the arc for each electrode. Calibrated in amperes, plate can be used with any make of electrode. Compensation for variations in voltage with the amount of current, as required by variations in electrode coatings, is attained by turning the one current indicator to the amperage setting desired in either the low, medium, or high voltage band.

Molding Machine

Osborn Mfg. Co., 5401 Hamilton Avenue, Cleveland, announces a new line of jolt rockover pattern draw molding machines of the portable type developed to meet certain jobbing and semiproduction conditions where foundries require speedy handling of a wide range of flasks.



The new machines are available in three sizes. One has a lifting capacity of 600 pounds, for a maximum flask width of 24 inches overall and a pattern draw of 10 inches. The second with similar flask width and pattern draw handles a 1000-pound load. The third has a lifting capacity of 1000 pounds, 10 inch pattern draw and can accommodate flasks up to 32 inches overall width.

Siphon

Pulmosan Safety Equipment Corp., 176 Johnson Street, Brooklyn, has devised a siphon for discharge of acids and chemicals from carboys, drums and barrels. It consists of an acid-resistant casing inserted into the container, with a flexible plastic siphon tubing, and positive flow control valve at the pouring end. Simple pumping action of tubing inside the casing generates a steady flow.

Core Truck

Chicago Mfg. & Distributing Co., 1928 West Forty-Sixth Street, is introducing a new two-wheel core truck having a

loading capacity of 700 pounds. Entire truck is made of steel. Loading tray, measuring 24 x 40 inches, sustains the load on extra heavy coil springs. Handles

(*Continued on page* 143)

"try these on for size... Hermann Goering!"

You're so fond of fancy uniforms, Fat Boy. *How d'you like the cloak of doom?* For you're looking at part of it right this minute... at part of the greatest flow of fine and flawless castings any nation has ever turned out. You didn't think it could be done. And neither did Der Funnyface behind you.

You didn't think Berlin could ever be bombed, either.

And one little, important part of the reason you were wrong all the way has been Penolyn Core Oil. Quick-baking, fast-cleaning, it helps reduce rejects, helps speed results... has helped America's foundrymen turn in a stirring and magnificent performance!

You're going to look sweet in black, Fat Boy!... You're going to look sweet in black!

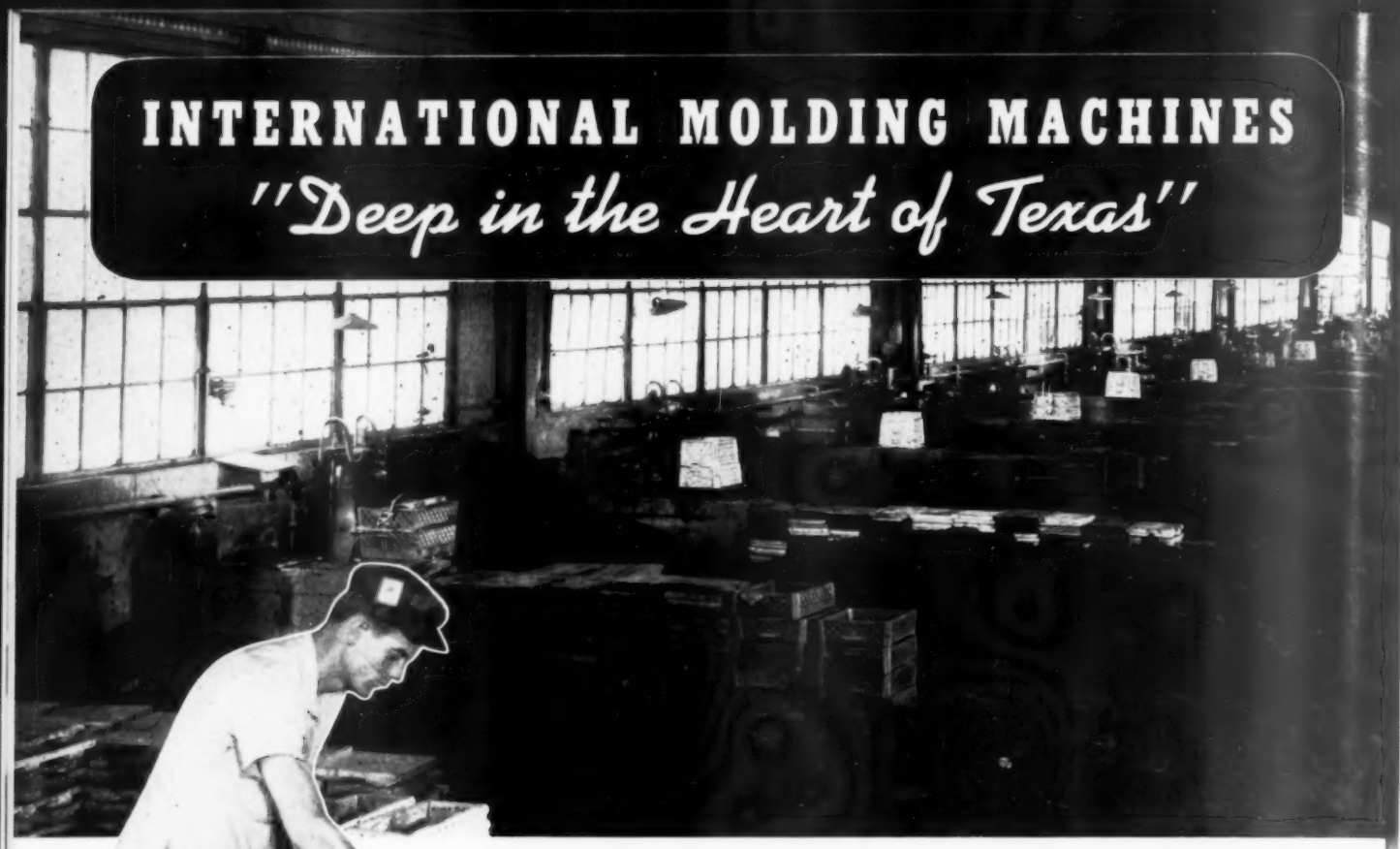
Penola
Reg. U.S. Pat. Off.

PITTSBURGH, PA.

NEW YORK • CHICAGO • DETROIT • ST. LOUIS

INTERNATIONAL MOLDING MACHINES

"Deep in the Heart of Texas"



Type PJS
Jolt Squeezer

Type G
Jolt Ram,
Power Turnove
Foot Draw
Machine

Type JDP
Jolt Ram, Pow
Pin Lift Machi

Speed up your shop - Increase the flow of Castings needed to build War Weapons by using

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Meet your obligations to advance the date of VICTORY

A copy of our new KEY Catalog sent upon your request

INTERNATIONAL MOLDING MACHINE CO.

2608-2624 W. 16th St., Chicago, Illinois

(*Continued from page* 140)
and underframe are made of 1-inch black pipe. Ball-bearing-equipped wheels have four-ply pneumatic tires 16 inches in diameter.

Hose Clamp

Aircraft Standard Parts Co., Rockford, Ill., has introduced a new line of hose clamps in 14 sizes from ¾-inch to 4-inch inside hose diameter. They consist of a 9/16-inch tempered steel band punched with holes corresponding to the teeth of a worm gear. These holes mesh with a worm in the housing welded to the fixed end of the band. Worm is turned by a screw driver, the screw head being fitted with a cup which prevents the screw driver from slipping and puncturing the hose. Worm and gear action keeps clamp tight when the band is under tension.

Electrode Holder

Jackson Products, 3265 Wight Street, Detroit, has developed an air-cooled electrode holder for use on heavy metallic arc welding work. Intended to relieve the discomfort caused the operator by heat resulting from use of rods ½-inch and larger, the holder is cooled by air at from 3 to 4 pounds pressure, traveling the entire length of the lower tong. Air is introduced by connecting the inlet tube to the plant air line.

Welding Curtain

Industrial Products Co., 2820 North Fourth Street, Philadelphia, is offering a welding curtain designed to confine welding operations to a given area and protect other workers from harmful rays. It also serves as a protecting shield against

flying chips and scale during cleaning operations. Curtains are made of special flameproof and waterproof canvas, or asbestos. Double row stitching is used on all seams. Substantial hem is used on all edges, and corners are reinforced. Eyelets are spaced 10 inches apart across the top, with two in each lower corner.

Push Button

Northern Engineering Works, 2615 Atwater Street, Detroit, has developed a multiple speed push button which provides up to five speeds in a single button. While designed primarily for crane and hoist operation, the button is easily adaptable to any machine where pilot or relay circuits are used. Button is of simple construction and subject to little wear in operation. As the button is pushed in, it moves a metal cylinder to wipe over a succession of contacts. Contacts are steel balls mounted on springs, stiff enough for the operator to "feel" the successive clicks but still easily operated.

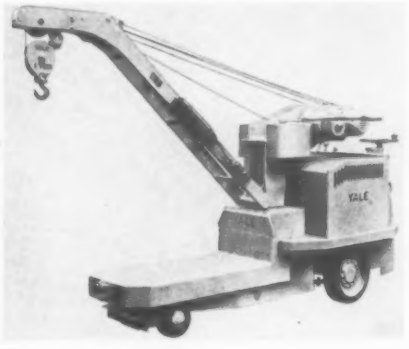
Reinforced Glove

Industrial Gloves Co., Danville, Ill., has developed a new type steel reinforced gauntlet for heavy duty handling. Steel ribbons are placed diagonally to give protection against cutting edges of material handled. Entire palm, extending

up the first joint of all fingers and well around to the back of the fore finger is reinforced with extra leather. Thumb is patched and strapped, and all closing seams are stitched with steel. The glove is available in pairs or for either hand.

Crane Truck

Yale & Towne Mfg. Co., 4530 Tacony Street, Philadelphia, is offering its 6000-pound capacity low elevating platform truck combined with a 2000-pound capacity crane to provide a dual materials handling unit. Electrically powered with



four speeds forward and reverse, the unit is compact to give maximum maneuverability in close quarters plus greater visibility and safety for the operator. A winch supplies hoisting and booming power and both can be operated simultaneously. Separate motors and power units drive the truck for travel as well as hoist and boom the load.

Mechanized Sweeper

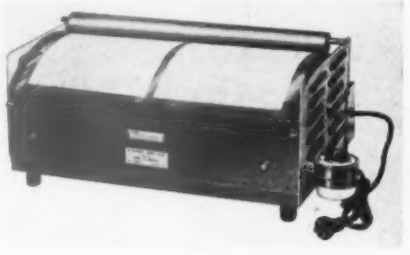
Moto Mower Co., 4600 Woodward Avenue, Detroit, announces a mechanized sweeper for small and medium sized plants said to be capable of cleaning at the rate of 16,000 square feet per hour. It will pick up small pieces of scrap metal as readily as lighter dirt and dust. Two larger motorized models for plants with extensive floor area also are available.

Tool Grinder

Delta Mfg. Co., Milwaukee, has introduced a low-cost grinder for grinding the chip-breaking groove in carbide tipped tools, also for grinding form tools, thread chasers and other units which must be accurately formed. A special vise, which holds work at any desired angle, can be removed to use the unit as a surface grinder.

Printer

Peck & Harvey, 4327 Addison Street, Chicago, announces a fast low-cost printer for making blueprints or black and white reproductions. The device shown in the accompanying illustration, a portable table model, can be plugged into any standard electric outlet. It is available in two sizes, one for prints up to



12 x 18 inches, the other for prints up to 18 x 24 inches. Actual printing surface is over-size to prevent crowding, overlapping or blurred edges. Printing on a curved glass surface gives perfect contact without the inconvenience of wrapping the prints around a cylinder.

Pressure Generator

Scott Aviation Corp., Lancaster, N. Y., is offering its hydraulic pressure generator, developed originally for actuating aircraft brakers, for industrial applications, such as motion transmission, jig actuation, etc. Manually operated, it is available in several models with different lever and pedal arrangements, it is a completely sealed system which elimi-

Honor Employes of Enterprise Engine & Foundry Co.

Employes of Enterprise Engine & Foundry Co. were paid tribute at ceremonies held May 25 at the company's San Francisco, South San Francisco and Richmond, Calif., plants. Service emblems and certificates of award were presented all employes with 5 or more years of service. At left is Henry Martens, one of the company's founders, speaking at the San Francisco plant. Group at right includes, left to right: Jack Wright, shop representative; Pete Rodriquez; Serge Kovaleff, production manager at San Francisco; George Panario, chairman of the board; Charles Hoehn Jr., manager of the foundry division; Gertrude Covel; Howard MacCord; Myrtle Thompson; Henry Martens; James W. Heaney, co-founder of the company, and Charles J. P. Hoehn, president

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nates need for a reservoir of any kind. Pressure up to 500 pounds with displacement of 0.8 cubic inch is obtainable.

Belt Grinder

Hammond Machinery Builders Inc., Kalamazoo, Mich., has incorporated various new features in its abrasive belt grinders, including a heavier, larger cast base; larger sludge pan; and new pulley-motor mountings which are adjustable and accessible from the outside. Machines are adjustable from vertical to horizontal

position while in operation, and are available as bench or floor model. Floor model illustrated is adapted to both wet and dry operation. Equipped with tank and pump unit, it can also be equipped for water-main connection only. For dry operation the drain connection is replaced by the air exhaust system.

Thermometer

Taylor Instrument Cos., Rochester, N. Y., is introducing a new industrial thermometer having a one-piece case. Case is shallow, giving wide angle of vision. Glass front is held against tension springs fastened by shakeproof screws. Instrument is available in various combinations of straight and angle stems, with threaded or union connections and in different temperature ranges between -40 and 750 degrees Fahr. Standard scale lengths are 7 and 9 inches.

Eye Mask

Standard Safety Equipment Co., 232 West Ontario Street, Chicago, is offering a new all-plastic eye mask said to have strong impact resistance; causes no distortion or reflection; is non-inflammable, easily sterilized and deep enough to be worn over prescription lenses. It weighs less than 2 ounces and can be refinished to remove minor scratches.

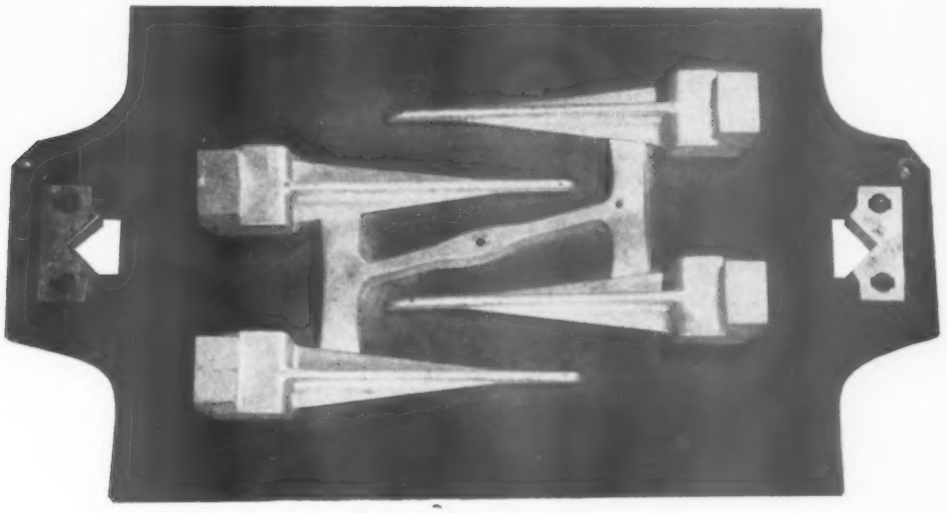
Automatic Control

Bristol Co., Waterbury, Conn., announces a new air-operated automatic instrument for automatically controlling temperature (up to 3600 degrees Fahr.) flow, liquid level, pressure, draft humidity, pH value and time program. It operates on the same basic principles as that used in previous models, but has been simplified and made more convenient to service.

Glue Company Enlarges Laboratory

Newly enlarged laboratory of the Franklin Glue Co., Columbus, O. Robert F. Snider, director, is in the right foreground. Equipment for making every type of experiment related to gluing has been installed, including the most delicate type of scale, and a full-size incubator in which any desired climate can be reproduced. Much of the experimentation is at the request of industrial plants, such tests involving the use of glue in holding different types of materials under varying conditions

LIGNOLITE
PATTERN PLATES



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- UNIFORM CALIPER
- LIGHT WEIGHT
- HIGH STRENGTH
- EASILY MACHINED
- MOISTURE RESISTANT

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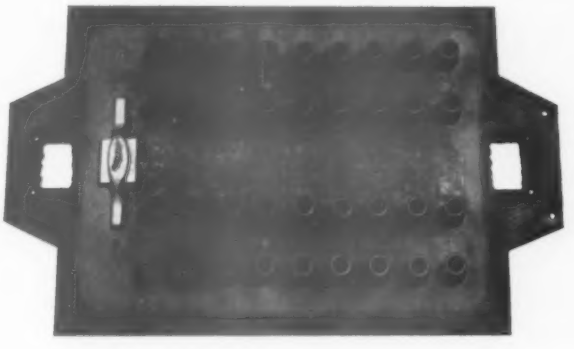
42 James Street, South Hamilton, Ont.

STANDARD SIZES—HOW TO ORDER

Available in all flask sizes, 3/8" to 2" thick. Standard plates are octagonal in shape with 1" allowance for flask and 2½" allowance for ears. Sheets are also available for own cutting. Sizes are 46" x 46" for thicknesses from 3/8" to 1½" inclusive; 40" x 40" for thicknesses over 1½". Please write for sample and complete information.



MARATHON CHEMICAL COMPANY
DIVISION OF MARATHON PAPER MILLS COMPANY

ROTHSCHILD **WISCONSIN**

Steel Foundry Wins Army-Navy "E" Award

Employes of Sivyer Steel Casting Co., Milwaukee, who were selected for the token presentation of "E" pins at the recent awarding of the Army-Navy "E" flag to the company. Left to right are John Kuzba, Esther Schultz, John Verbruggen and Lillian Cassebaum. M. A. Fladoes, president of Sivyer, accepted the award from Col. John Slezak, Chicago Ordnance District

Adds Gold Star to "M" Pennant

Homestead Valve Mfg. Co., Coraopolis, Pa., again has been honored by the U. S. Maritime Commission by receiving a gold star for its Maritime "M" pennant, signifying continued outstanding achievement in the production of war products. The company originally was granted the award in November, 1942.

Effect of Graphite Particle Size

(*Concluded from page* 130)

graphite system rather than the metastable iron-iron carbide system.

The author is indebted to the metallurgy department of the University of Minnesota for their helpful suggestions throughout the investigation; also to Herbert F. Scobie of the foundry department at the university for guidance, suggestions and assistance.

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Book Review

Ferrous Production Metallurgy, by John L. Bray, cloth, 457 pages, 6 x 9 inches, published by John Wiley & Sons Inc., New York; price $4.00.

This volume on the production of iron and steel is designed for junior or senior students in metallurgical engineering, and constitutes a clear and detailed exposition of the various phases pertaining to present day practice. It is divided into 14 chapters each of which is followed by a bibliography. The first three chapters describe the history, raw materials and the metal iron. The iron blast furace, wrought iron and cementation and crucible processes are discussed in Chapters IV, V, and VI. The next four chapters are devoted to a description of the bessemer, basic open-hearth, acid open-hearth, and electric furnace processes. Scrap is the subject of Chapter XI while ingots and ingot molds, and ferroalloys are discussed in Chapters XII and XIII.

Delta Oil Products Presented "E" Award

Delta Oil Products Co., Milwaukee, manufacturer of foundry compounds, was presented the Army-Navy "E" on June 22 for excellence in war production. J. A. Gitzen (left), president, is shown receiving the award which was presented by Col. Elmer C. Goebert (extreme right). In the rear of the pennant are Jack Everts, representing Delta employes, Lieut. Comm. T. H. Jones, USNR, and Herbert Schmid, company secretary and treasurer

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Industrial Trucks Need CAREFUL INSPECTION

By A. E. DOROD
Baker Industrial Truck Division
Baker-Raulang Co., Cleveland

INDUSTRIAL trucks pay dividends only so long as they are kept in operation. Provide good floor conditions and do not overload. With tires so difficult to replace, greater care should be paid to floor conditions. Aisles should be kept clear of chips, scrap and anything else that tends to cut tires. More industrial truck tires have been cut to pieces than ever have worn out. Each truck is designed to carry a definite load. Overloads tax the various component parts and materially reduce the active life of the truck.

Blow the dust and dirt off the truck daily before oiling the cold points. Wipe oil holes clean and oil all bearings, pins, joints and other cold points on brakes, steering linkage, interlocking mechanisms and switch controls. Check battery in accordance with manufacturer's instructions.

Test The Brakes

Every week test service brakes for stopping with heaviest load. Test parking brakes for holding maximum load on steepest incline. Inspect brake linings to make sure they are not filled with dirt or grease. If necessary remove shoes and wash in gasoline. Worn lining should be replaced with grade equal to original. Make sure shoe fits drum. Inspect brake drum for scores or roughness. Where brakes are timed with electrical interlock to main travel controller and contactors care must be taken not to disturb this timing when adjusting brakes. See that all steering connections are kept tight, but that steering control works freely.

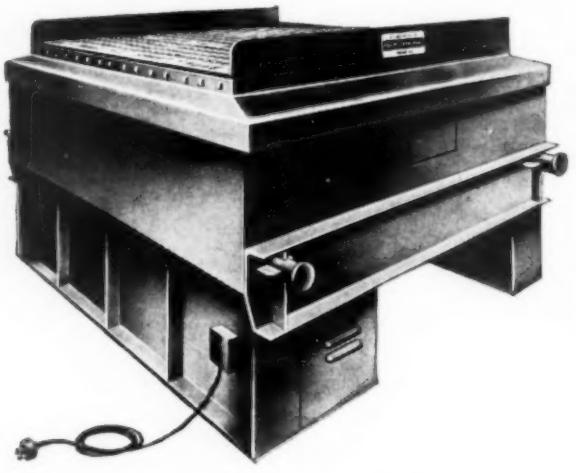
Test for lost motion at ball joints and rod yokes; tight joints at rod yokes due to bent levers or rods; misalignment of steering wheels; worn bearings in steering post or bell crank. Excessive play in ball points should be taken up by loosing lock nut and taking up on adjusting screw. Worn ball pins should be replaced. Loose connections indicate wear and should be replaced. Straighten bent rods with faces parallel. Replace bent levers. Do not attempt to straighten them. On four wheel steer trucks the usual cause of wheel misalignment is bending of the C lever by hitting an obstruction. Check alignment by placing two long straightedges against side of power axle wheels, touching rims at two points and extending past trailing axle wheels. The wheels are adjusted by cross rods until they become parallel.

On the lift or hoist, clean all grease and dirt from rails. Inspect chains and anchor bolts and hydraulic lever to valve and limit switch. Place a few drops of oil on valve plunger and piston rod if they stick. Hydraulic hose may be disconnected at upper end of cylinder and a little neatsfoot oil inserted directly on the leathers. When working in extremely dusty environment it is well to remove covers from motors, controller, contact and limit switches and blow out any dust. Bleed moisture from air line before blowing out electrical equipment.

Monthly inspection involves the most important mechanical parts, power axle, wheel universal joint, wheel bearings, spindle bearings, drive and torque yokes, oldham coupling, trailing axle and wheels, brake drum, motors, brushes, controller, contactor, limit switches, hydraulic lift.

Twice yearly the industrial truck should come in for complete checkup. This includes changing the castor oil in the power axle, changing the hydraulic oil in the lift reservoir, taking out wheel bearings, cleaning and repacking them, if not done every month. Special attention and inspection should be made of the wiring to make sure insulation is in good condition. Check all electrical connections for tightness.

Where foundry space is limited



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. . . brings all the benefits of shakeout time- and labor-saving, without the need for permanent installation or elaborate sand-removing mechanism.

This Shakeout is *portable* . . . It can be brought by crane to the spot most convenient to the flasks—and stowed away when idle. In spite of its small size, it retains the Robins *full-floating* principle: vibrated portion and imposed load are borne by heavy-duty coil springs. No projecting parts, no eccentric shafts, no rigidly-fixed vulnerable main bearings. It shakes the flask . . . not the building.

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Westinghouse Electrical & Manufacturing Co
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and others

For magnesium, aluminum and other non-ferrous metals, Ross Core Ovens insure, (1) uniform distribution of heat with small temperature differential, (2) increased air flow to prevent stratification, (3) controlled temperature curve (zone control when required), (4) maximum capacity, (5) minimum through metal — low heat loss. The Ross advanced method of heat control and air distribution is available in the complete line of sizes and types of Ross Core Ovens.

The first continuous combined heat treating and aging ovens for both aluminum and magnesium castings were designed by Ross. These Ross Ovens combine solution heat treat and aging in one process and involve only one loading and unloading operation. Other Ross Ovens are of the compartment or stationary types, heated by oil, gas or electricity.

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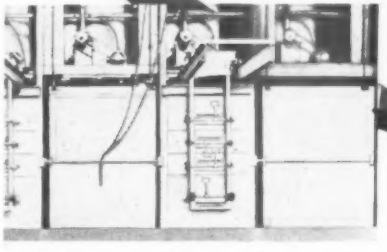
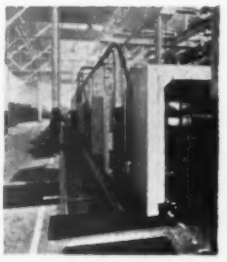
Ross Panel Construction permits quick assembly, relocating or enlarging. Consult us on your Core Baking and Heat Treating requirements. No obligation.



Multiple Compartment Core and Mold Oven. Middle compartment of each group has a series of drawers for small cores. On each side are doors of compartments for racks containing larger cores and molds.

Continuous Conveyor Type Core Oven in Magnesium Foundry. Batch type available for smaller production.

Continuous Conveyor Type Core Oven in Aluminum Foundry. Batch type available for smaller production.



Magnesium Heat Treating Oven for large production in airplane engine plant. Continuous automatic type.

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On the other hand, the best employee-relationship in the world can go for naught if a faulty hygienic condition is permitted to exist. Take dust for instance—a more annoying and fearsome condition is hard to find, yet it is one of the most common of all.
If there is the slightest doubt about the efficiency with which dust is being controlled in your plant, check into it without fail. It may be the cause of low employee morale, poor workmanship, and sluggish production.
If you find that it is, or need help in your investigation, we will be glad to put a trained dust control engineer at work immediately. In the meantime write for information on American dust control equipment.
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BUILDS FOUNDRY IN RECORD TIME

(*Continued from page* 106)

The west bay of the main foundry building adjacent to the material yard is occupied by the brass foundry, compressor room, shop offices, cupolas and charging floor, main molding sand storage and the cleaning room. The center bay is devoted entirely to molding and sand reconditioning. The east bay embraces the core room, core ovens, core sand storage bins, wash and locker rooms.

Iron is melted in three furnaces lined to 60, 54 and 48 inches repsectively. Air for the cupolas is supplied by three centrifugal blowers equipped with automatic air weight control, and with capacity of 7000, 6000 and 4400 cubic feet per minute at 1.25 pounds pressure, respectively.

High pressure air for the many air tools in use throughout the foundry is supplied by a compressor having a capacity of 895 cubic feet of air per minute, five step clearance control, and driven by a 175-horsepower engine type synchronous motor. This compressor is equipped with a suitable after cooler and also with a separate motor generator exciter set.

Adequate Cleaning Room

The cleaning room in the west bay extends northerly approximately 190 feet from the main molding sand storage to the end of the foundry, and is served by a 25-ton crane having a hook height of 34 feet. This room also contains two dust removal units, a 36 x 54-inch tumbling barrel, a safety emery grinder, small tool grinders, a 10-ton platform scale, a 10 x 15 x 22-foot car type annealing furnace equipped with automatic oil and gas burners and a three-compartment hydroblast system for casting cleaning, the first unit of its type installed on the Pacific coast. In addition to cleaning castings, the tremendous water pressure and velocity creates an air current which, in turn, becomes a form of air conditioning for the plant, drawing the dust laden warm air into the working area, where the water wets out the dust particles and dispenses cool air throughout the cleaning room. The system has made it possible to reclaim approximately 75 per cent of the core sand which, after being washed and classified, is collected in de-watering bins. The sand is removed by a grab bucket from the bins to a truck which, in turn, unloads the sand to a bucket elevator discharging into one of the main sand storage bins in the core room. The de-watering bins and sludge disposal are located in the material yard immediately under a crane.

A briquetting press in the north end of the material yard with a capacity of 2 tons per hour is used for briquetting

cast iron borings. Borings are delivered directly by crane to a hopper on the press, and the briquets, in turn, are delivered to the charging floor by the same crane.

A motive type sandslinger with a ramming radius of 20 feet moves the entire length of the main molding bay on a standard gage track in the center of the bay. Power is drawn from an underground, 3 phase, 440-volt trolley system, thus eliminating the long cables usually supplied with machines of this type. The underground collector system is new to the coast insofar as this particular installation is concerned, and has fully proved its merit. A portable sand conditioning unit equipped with magnetic pulley prepares sand for the sandslinger and a muller prepares the facing sand.

Generous space has been allowed on the foundry floor on either side of the track for pits and flasks. All pits are within reach of the ramming arm. Flasks are set up on either side of the track for ramming and are then set back for pouring operation, permitting ramming operations to continue during the pour-off.

The core room in the east bay of the foundry is equipped with two 4-oven batteries, recirculating type automatically fired with oil or gas. Each oven is 12 feet wide, 10 feet high and 20 feet deep. Cars have a capacity of 30 tons. Small cores are handled in a four-compartment, shelf type, gas-fired oven.

Prepare the Core Sand

Core sand is prepared in two mixers, equipped with loading devices and located centrally in the core room between the two sand bins. Core ovens, sand mixers and sand bins, wash and locker rooms and storage for oil, flour, pitch, compound, etc., utilize approximately 30 feet of the 75-foot bay. The remaining space is devoted exclusively to coremaking and is serviced by four 3-ton, 45-foot span, floor controlled cranes. Transfer tracks extend from the core room into the main molding bay for the delivery of cores to the main bay of the foundry.

The main molding floor, 75 x 425 feet is served by two 30-ton and two 10-ton cranes having a hook height of 34 feet. The cleaning room is served by a 25-ton crane; and the core room by four 3-ton cranes. The material yard is served by two 60-foot span, 10-ton cranes having a hook height of 40 feet. The brass room is served by a 34-foot span crane. Cross travel is 75 feet and hook height 20 feet. Jib cranes on the columns in the core room and in the main bay facilitate coring operations.

Considerable difficulty was encountered in securing cranes for the foundry. To facilitate coring-up procedure and to make the few overhead cranes available for main foundry operations, portable car type jib cranes with air hoist were developed, to be operated from the sandslinger track or from auxiliary tracks back of the several pits where they are used.

All pits are equipped with an ingenious clamping device, developed by

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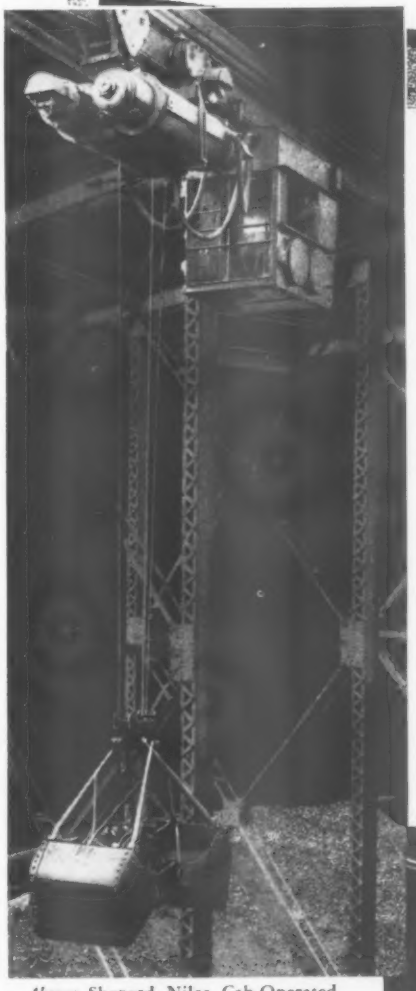
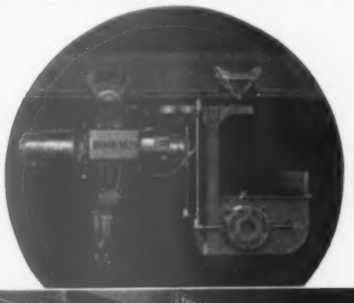
Monorails!
"AERIAL RAILWAYS OF INDUSTRY"



Above: Shepard Niles Cab-Operated Monorail equipped with clamshell bucket. For indoor or outdoor service.

Where speed must team up with accuracy and dependability in handling loads, indoors or out, or both, Shepard Niles Cab-Operated Monorails are proving themselves to be of invaluable assistance in many busy plants. "Just couldn't get along without them," is the way one manufacturer puts it. Let us show you what this equipment will do for you. There is a Shepard Niles representative in or near all war production centers.

Below: Shepard Niles Trailer-type Monorail. Furnished with either open or enclosed operator's cab.



Shepard Niles Cupola Charger Monorail for charging cupolas or for general yard handling.

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★ ENGINEERED FOR FASTER PRODUCTION ★

Arthur Knutsen, foundry superintendent, and shown in an accompanying illustration. Copes can be clamped down in a few minutes thus eliminating the time necessary to shuttle the weights about the molding floor by the overhead cranes. Valuable molding space is conserved by the elimination of large foundry weights, generally used for weighting down molds.

In the heating and ventilating unit the heaters are fired with oil burners, thermostatically controlled for temperature and are equipped with switches to provide a circulation of air during the summer months.

Smooth and efficient operation of the foundry, employing 375 men in one shift, is attributed to close teamwork. With manpower shortages, it has been necessary to break in many new men. Careful supervision of these men until they are well broken into the job has paid dividends in lessening lost time in accidents and improving the speed of work. Stations are well established for each man. Each is given clear instructions as to what he is to do. The result has been a smooth flowing operation with a minimum of delays and set-backs.

Constructed rapidly under wartime stress the foundry has established an excellent production record which naturally will be improved with further planned improvements, and the changes that come with the experience of continued operation.

Book Review

Principles of Metallographic Laboratory Practice, by George L. Kehl, 453 pages, 6 x 9 inches, published by McGraw-Hill Book Co., New York, price $4.

This second edition of a book designed to bridge the gap between theoretical physical metallurgy and its practical application in the laboratory has been revised and extended to include the latest and supplementary laboratory manipulations and processes, and to illustrate more profusely effects of correct and incorrect techniques.

The book is divided into 9 chapters of which the first covers the details of preparation of specimens for microscopic examination. The second relates to the etching of specimens for examination while the third is devoted to a discussion of metallurgical microscopes and photomicrography. The fourth chapter is concerned with the principles of photography, and the fifth describes the microscopic examination of metals.

Hardness testing is discussed in the sixth chapter, and special metallurgical tests in the seventh. The eighth chapter describes the principles of pyrometry and pyrometric practice, and the ninth is devoted to thermal analysis. The book concludes with an appendix containing some 50 useful tables giving data on electrolytic polishing of metals, etching reagents, identification of inclusions, photographic developers and fixers, etc.

PATTERNS AND NONFERROUS CASTINGS

(*Continued from page* 109)

a double garage and commenced making patterns mostly for firms which needed a few patterns now and again, but not in sufficient volume to keep their own pattern shops in operation. The following year with six men on his payroll he moved to larger quarters and with a slight increase in his staff he moved to the present location in 1938. A foundry was added in 1939 and the employe force raised to 30 men. The year 1940 showed a steady increase in business, the building was expanded and the force increased to 40 men. Each year since, floor space has been increased, new equipment installed and additional men added to the payroll. Recent addition includes floor space and special equipment for handling magnesium castings. Growth is reflected in the gross business figures for the past 5 years: 1938 $16,000; 1939 $25,000; 1940 $68,000; 1941 $190,000; 1942 $224,000. Approximately 17 per cent of total plant capacity is devoted to the production of production patterns; 27 per cent to production of miscellaneous brass and bronze castings; and 56 per cent to the production of aluminum castings.

Room for Expansion

The plant is surrounded on three sides by paved streets. On the fourth side land is available for further expansion. Trucks can come directly to the loading platform. River transportation is available within 2 miles either in St. Paul or Minneapolis. Railroad sidings in the immediate vicinity connect with the following railroads: Great Northern, Northern Pacific, Chicago & North Western, Soo Line, Minneapolis & St. Louis; Chicago, Rock Island & Pacific; Chicago Great Western; Chicago, Milwaukee, St. Paul & Pacific; Chicago, Burlington & Quincy.

Early in the present year congestion in several departments was relieved by the erection of a new foundry building 60 x 70 feet, amply lighted and ventilated through windows in the walls and in the monitor roof. The walls are constructed of cinder-concrete tile and the roof is supported on wood beams. The beams also support a monorail system. Four longitudinal steel I-beams extend from one end of the building to the other end, about 8 feet from each side wall and two about 4 feet apart in the center. Two long I-beams are suspended by trolleys from the longitudinal beams in such a manner that they may operate either independently, or in line with each other. With this arrangement metal can be conveyed readily to any point on the foundry floor where the molds are ready. An extra branch of the system extends into the brass and bronze furnace room where the furnaces are lo-

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Diam. at start of test	24"	24"
Diam at end of test	22-7/8"	21-1/4"
Cu. in. in a 24" wheel	904.78	904.78
Cu. in. used	82.44	195.48
Cost per cu. in. usable material	$ 0.026	$ 0.026
Cost of cu. in. used	$ 2.14	$ 5.08
Weight of castings before grinding	4910.5	6998
Weight of castings after grinding	4809.5	6895
Pounds of metal removed	101	103
Total working hours	9-1/2	9-1/2
Pounds of metal removed per hour	10.62	10.84
Cu. in. wheel wear per hour	8.67	20.57
Wheel cost per hour	$ 0.225	$ 0.518
POUNDS OF METAL REMOVED PER CU. IN.	1.22	.521
WHEEL COST PER POUND OF METAL REMOVED	$ 0.021	$ 0.049
Wheel dressings	Low	Low
Operators opinion of wheels	Good	Do not like

Why sacrifice the wheel to get the work out? Why not let Cortland show you what "Plus Wheelpower — minus Wheelcost" can do for your snagging? A Cortland Engineer will help you select a Cortland Wheel to do a bigger job . . . all 'round.

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cated in the position they formerly occupied before the new foundry was erected.

Floor in the new foundry and in the old furnace room is concrete with the exception of a strip 4 feet wide in front of the furnaces where the crucibles filled with molten metal are set down and skimmed before they are lifted into the pouring bail and hoist suspended from the overhead steel beam. Returning empty, hot crucibles also are placed on the brick floor before they are lifted and placed in the furnaces. Good housekeeping is practiced all through the plant and is reflected in the smooth, clean floors, wide aisles, ample space between pieces of equipment, and walls that are painted white. Gas fuel for the furnaces and for other purposes is a factor in maintaining cleanliness throughout the plant. Individual gas heaters are mounted at various points on the walls near the roof and keep the shop warm and comfortable, an important feature in this part of the country where winter really is winter. A well-appointed wash and locker room is provided for the employes in an adjoining part of the main building. A first aid room is provided with the necessary equipment to take care of employes suffering from any of the minor injuries and accidents inevitably connected with the operation of any industrial establishment.

Work Two 8-Hour Shifts

Molding floors which occupy the entire area of the new foundry extend from the side walls to a wide central gangway. The molding machines, at present operated on two 8-hour shifts, are set up close to the walls, and the molds are carried out and set up on wood skids to facilitate the work of the men pouring the metal. In certain instances where it is advisable to pour metal into the molds while in an inclined position, one side of the skid is higher than the other.

Approximately half the orders are for long running jobs that can be made in snap flasks on combination jolt-squeeze machines. After the molds are set out on the skids they are enclosed in aluminum slip jackets. With five furnaces melting brass and bronze and four furnaces melting aluminum, a supply of metal is available at all times before any molder has filled his floor with molds. Miscellaneous general jobbing castings, ranging in weight from a few pounds up to 1000 pounds, are molded in wood flasks on the floor according to ordinary foundry partice.

Light castings on the machine molding floors are shaken out almost immediately. The slightly warmed sand is wet down and turned over and then thrown back to the pile in the vicinity of each molding machine where the molder can reach it with a minimum expenditure of time and effort. In this manner he can concentrate on the job of operating his machine to maximum capacity. Other men pour the metal, shift weights and slip jackets, shake out the castings, carry them to the cleaning room, pile the bot-

tom boards and jackets and prepare the sand.

Brasses and bronzes to meet a wide range of specifications are melted in one 1200 and one 600 pound capacity tilting type crucible furnaces and in three stationary type furnaces lined to accommodate No. 70 pots. According to the accepted American nomenclature of 3 pounds per number, that means that the pot holds approximately 200 pounds of metal. The furnaces are fired with gas and the temperatures are closely maintained under pyrometer control. Each furnace lid suspended by two rods from a swivel post at the back, easily is pushed temporarily to one side while placing the empty crucible in the furnace, and later for the removal of the crucible filled with molten metal. Metal is charged through an opening in the cover which in this manner serves as a preheater ring or collar on the pot. A hooded chamber above the furnaces and open windows in the back wall remove smoke and flame from the open top of the furmosphere all the time the furnaces are in operation.

To facilitate lifting the crucibles into and out of the furnaces about 2 feet

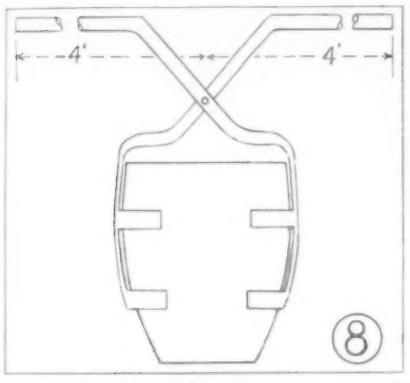

Fig. 8—Special claw tongs for lifting crucibles into and out of furnaces

above the floor level, a modified type of the ordinary double claw crucible tongs is employed. Instead of extending straight up and held together with a link, the handles of the tongs are bent at an angle that brings them to a horizontal position when the claws grip the crucible, as shown in Fig. 8. With this device the man at each end of the long handle is not exposed to the heat and flame from the open top of the furnace.

A locking device which holds the crucible firmly in the shank at any angle is the essence of simplicity. A 1-inch diameter steel rod is attached at the lower end to a projecting bracket on the band into which the crucible is placed. The rod and bracket occupy a position at the back of the crucible, or opposite the pouring spout. A flat piece of steel bar ½ x 2 x 6 inches extends from the upright rod to a point slightly beyond the inner edge of the crucible. A 1⅛-inch diameter hole near the outer end of the flat bar permits the bar to move either up or down on the rod. When the inner end of the bar rests on

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the edge of the crucible, the outer end slides down a short distance on the upright rod. When the crucible is tipped the upper edge exerts a certain amount of pressure against the inner end of the bar. This in turn causes the outer end to grip the upright rod tightly. The action is entirely automatic and requires no attention or adjustment on the part of the man engaged in pouring the metal.

Aluminum alloys are melted in a battery of four gas fired furnaces located in a corner of the foundry at the opposite end from the brass and bronze melting furnaces. Cast iron pots supplied by a local gray iron foundry are enclosed in brick lined sheet metal shells and the entire battery is surmounted by a galvanized steel hood in which the fumes are collected and discharged into a chimney. The molten aluminum is dipped out of the furnaces in stainless steel hand ladles.

Research Institute of America, 292 Madison avenue, New York, has published a 92-page booklet entitled, "Manpower—Solving the Problems of Labor Shortage". It is divided into 12 sections covering various phases of the problem under such headings as: Your labor supply, Your work week, Are you essential?, Non-deferable activities, Which employes will be in uniform?, etc.

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FOR ALL COPPER ALLOYS

PERFECT COMBUSTION FOR FASTER MELTING

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SAFETY TILTING • EASY HANDLING
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The Campbell-Hausfeld Co.

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BRITISH OPEN NEW LABORATORY

(*Continued from page* 103)

pletely predetermined, with respect to both temperature and duration of the heating cycle; also of an electrically heated salt bath furnace for temperatures up to 950 degrees Cent. This will be equipped with manually adjusted energy input regulator and temperature recorder.

The sands and refractories laboratory is equipped for tests on refractories, core and molding sands, binders and auxiliary materials. Sand preparation is carried out in a 10-pound muller type mixer and mechanical composition or grading is determined by a battery of elutriators and standard B.S.I. sieves shaken by a vibrator. Green strength and permeability are measured by the association's designs of compression tester and permeability apparatus. Dry sands are tested on a standard type cement tester, and for baked core sands a hydraulic machine capable of applying loads up to three tons is being obtained. Cores are baked in a thermostatically controlled oven with internal air circulation. High temperature tensile tests are furnished by special apparatus. Sands and refractories can also be examined microscopically, and for sintering melting points, gas-fired furnaces going up to 1600-1700 degrees Cent. are located in the experimental foundry.

Laboratory Well Equipped

The physical metallurgy laboratory is used for cooling curve determinations, dilatometric tests, experimental heat-treatment and pyrometric calibration, and in addition to the usual electrical instruments, is equipped with a potentiometer, recorders for noble and base-metal thermocouples and muffle and tube furnaces. A dilatometer, a platinum-wound tube furnace and lead bath, are being added and apparatus for measuring magnetic properties and resistivity obtained. An electronic dilatometer and muffle furnace are under construction.

The metallographic laboratory is equipped for the preparation, examination and recording of metal structures at any magnification, as well as equipment for ordinary photography and the production of negatives, prints, enlargements and duplicates in quantity. Two dark rooms are used. This laboratory proper contains modern polishing machines, visual microscopes and the latest design of projection micro-camera, fitted with a comprehensive range of eyepieces, objectives, light filters and polarizing apparatus. An optical lantern is also available with equipment for preparation of lantern slides. A press for mounting specimens in plastic material is being obtained.

The finishing processes and vitreous

enameling laboratory is concerned with the techniques and problems arising in connection with finishing processes, and particularly vitreous enameling. Both wet and dry process enamel can be made, prepared and applied on a small scale. Apparatus for metal preparation, mixing, melting, grinding and sieving enamel is installed. Enamel can be applied by dipping, spraying or dry dusting. An electric furnace is used for annealing, firing enamel and determination of enamel softening points and flow properties. Color and reflectance of enamels can be measured, as well as resistance to impact and chemical attack, the latter tests devised in the laboratory.

Sampling for chemical analysis, microscopic examination and preparation of test pieces for mechanical and physical testing are carried out in the machine shop, where apparatus within the capacity of the equipment available is made. Three drilling machines, a 7-inch all-geared lathe and two rough turning lathes, a 3-inch center lathe are available, with two mechanical saws capable of taking metal up to 8 inches thick, with tools for general construction and repair. An abrasive cutting wheel is used for white and very hard iron. The equipment is being supplemented by a milling machine and a shaper.

Conduct Mechanical Tests

The mechanical testing laboratory is equipped for the conduct of mechanical tests, transverse, tensile, compression, hardness, impact, damping capacity. The machines include a 50-ton universal and 10-ton machine; Brinell, Rockwell and diamond hardness testing machine, the Izod impact and Cambridge damping-capacity machine. A tensometer tensile testing machine is available for very small test pieces. Equipment is being obtained for fatigue testing, creep testing and short-time tests at elevated temperatures.

The chemical laboratory is concerned with chemical determinations and is equipped with the usual fume cupboards, muffle furnaces, titration bench, drying ovens and stills, and combustion trains for carbon determination. A platinum-rhodium wound furnace is also used for combustion sulphur determinations. The balance room contains two balances of the "chainomatic" type of rapid weighing, a semimicro balance and three other accurate balances. Apparatus is also available for determining oxides in pig and cast irons by aqueous iodine, total oxides by aluminum reduction. There is also a portable pH meter and a colorimeter. To this is being added an electro-deposition apparatus fitted for potentiometric titration, a photo-electric absorptiometer, vacuum fusion and vacuum heating apparatus for determining gases and total oxides in iron and steel, and a quartz spectrograph with accessories.

Acquisition of an x-ray tube for the study of appropriate materials by electron diffraction is under consideration

★

from furnace to pouring

VIA

CHICAGO TRAMRAIL

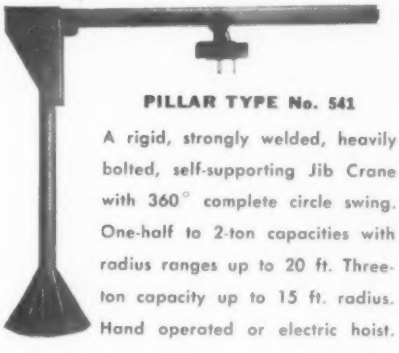
MONORAIL CRANES

Faster . . . Safer

Photos courtesy Atlantic Brass Works—Chicago

★ View at top shows man pulling a crucible of molten brass, which will soon be whisked from the furnace to the floor by a small-size Chicago Tramrail Furnace Crane. The skimming operation done, the load is then switched to the larger overlapping Monorail Crane (bottom view) which spans all molding points for rapid distribution of the liquid metal. All flasks can be poured direct from this crane.

A low-cost installation of this type is but one of many hundreds that have been designed and "built-in" by Chicago Tramrail engineers for speedier and safer overall foundry operation.



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And Jib Cranes are handling this operation with greater flexibility and speed, meanwhile releasing overhead cranes for other work. When ordering be sure to state lifting capacity, length of arm and distance from floor to arm. Illustrated circulars obtainable on request. Write

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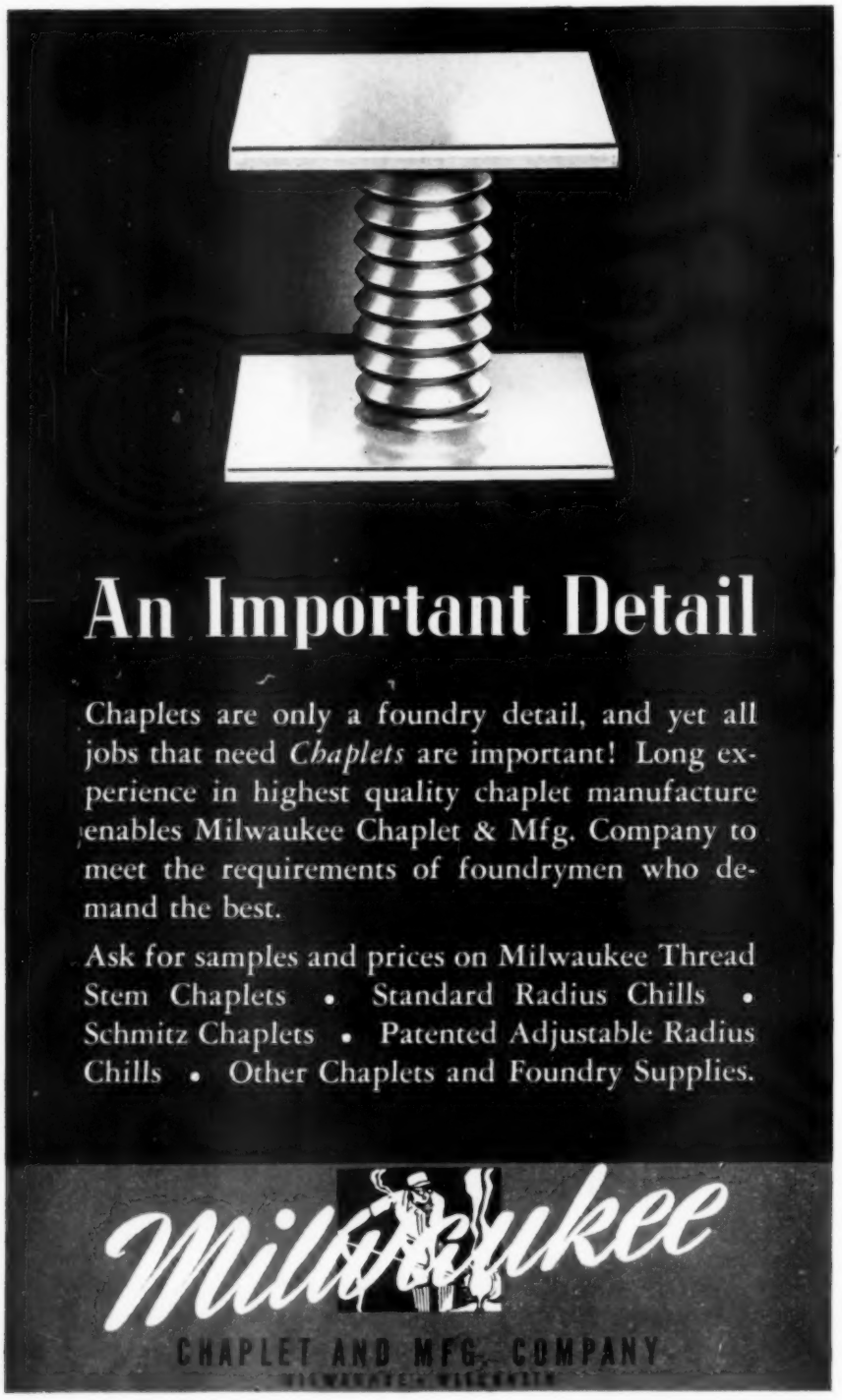
and probably will be housed in a small separate building with the spectrograph and equipment for determining mechanical properties at elevated temperatures.

It is claimed that the library contains probably the most comprehensive collection in the world of the literature of the founding industry, books, scientific transactions, periodicals, pamphlets, trade catalogs, lantern slides and patent specifications. The *Bulletin*, available to the association's members, abstracts articles on the industry and has listed some 200 translations made, 235 external reports and ten special publications. In addition, nearly 300 research reports have been issued. The library material is classified on a decimal system and is available to members for reference or on loan.

It is interesting to note that in 1925 the association set up a laboratory in Scotland. This was originally equipped for simpler chemical analysis and mechanical tests, but it can now be used for a wide range of chemical analysis, microscopic examination, sand testing, fuel testing and mechanical testing, with necessary sampling.

The British Cast Iron Research Association is managed most efficiently by J. G. Pearce, director and secretary of the association, who is well known to readers of THE FOUNDRY through his contributions to technical foundry literature and also through his visits to the United States which he made before the war.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Obituary

JOSEPH K. POLLOCK, 80, retired iron and steel executive, died in Cincinnati, June 14. He started his industrial career with the Norton Iron Works, Ashland, Ky., which was merged with the American Rolling Mill Co. Later Mr. Pollock became associated with Rogers, Brown & Co. as a salesman in the St. Louis office. He left that company to become treasurer of the Indiana Car & Foundry Co. but rejoined Rogers, Brown in 1896. In 1904 he was admitted to partnership in the firm, remaining with it until it was dissolved. Mr. Pollock was a former executive of two pig iron producing companies—vice president of Hanging Rock Iron Co., Hanging Rock, O., and president of Union Furnace Co., Ironton, O.

° ° °

Robert Eaton, 71, president and chairman of the board, Gillett & Eaton, Inc., Lake City, Minn., died June 20. Mr. Eaton had been connected with the company since 1892, and served as chairman of the board and president since 1917.

° ° °

Elmer A. Conway, 51, president, Great Lakes Mfg. Co., Wyandotte, Mich., died May 31. Mr. Conway was one of the founders of the company.

° ° °

Edward T. Fay, 47, vice president, Central Die Casting & Mfg. Co. Inc., Chicago, died in that city June 18 in an automobile accident. He had been associated with the company for 10 years.

° ° °

Aaron B. Champion, 62, former vice president of the Matthew Addy Co., Cincinnati, pig iron sales company which was dissolved in 1924, died unexpectedly in Chicago, June 16.

° ° °

H. R. Behnke, assistant chief engineer of the American Foundry Equipment Co., Mishawaka, Ind., died in South Bend, June 29, after a long illness.

° ° °

Madison F. McCarty, 55, research engineer, for the past 2 years supervisor of laboratories, Howard Foundry Co., Chicago, died June 13 in Chicago.

° ° °

H. S. Hitchcock, since 1936 president of Apex Steel Corp. Ltd., Los Angeles, died May 30.

Malleable Castings

Production of malleable castings in May totaled 69,959 tons compared with 72,559 tons in April and 60,696 tons in May, 1942, according to a recent report of the Department of Commerce. Orders totaled 79,983 tons compared with 74,141 tons in April.

Activities of FOUNDRY GROUPS

Cincinnati

ANNUAL stag outing of the Cincinnati Chapter of the A.F.A. was held June 16 at Hyde Park Golf and Country Club. Approximately 235 members and guests attended. Golf was enjoyed during the afternoon, through arrangements made by Billy Gilbert. An informal baseball game late in the afternoon was won by the "Foundrymen" with an 8 to 5 score over the "Vendors." The latter showed improvement, but not enough, and even a change in umpires did not alter the result. A steak dinner and floor show which concluded the event were enjoyed by all the members and guests.

Four new directors elected by the chapter to serve for three years include: W. J. Buvinger, Buckeye Foundry Co.; W. J. Love Jr., Lunkenheimer Co.; Joseph Schumacher, Cincinnati Milling Machine Co., and G. S. Twachtman, Chris Erhart Foundry & Machine Co. At a meeting of the new board on July 1, the following officers were elected: Chairman, Edward H. King, Hill & Griffith Co.; vice chairman, William A. Rengering, Cincinnati Milling Machine Co.; secretary, Martin F. Milligan, Lunkenheimer Co., and treasurer, William J. Love Jr., Lunkenheimer Co.

Committee chairmen elected include: Entertainment, William Gilbert Jr., Buckeye Foundry Co.; audit, George Twachtman and William Beiser, Reliance Foundry Co., and program, William A. Rengering.—*Henry M. Wood, secretary, pro tem.*

Northern California

ANNUAL meeting of the Northern California Chapter of the A.F.A. was held at the St. Francis Hotel, San Francisco June 18. President F. A. Mainzer was in charge and 187 members and friends with their wives and ladies were present to participate in the evening's program.

Mr. Mainzer gave an interesting report on the year's activities which included a total of 12 meetings. Membership increased by 84 members to a total of 214 in which are included the chapter's first four sustaining members. President Mainzer paid well deserved compliments to the program and membership committees and to all who had assisted in making the past year an outstanding one. Election of officers was conducted with dispatch to allow for a scheduled program of entertainment.

Officers elected to serve for the coming year are: President, Harry A. Bossi, H. C. Macaulay Foundry Co., Berkeley, Calif.; vice president, Ralph C. Noah,

GATES and RISERS in any metal

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Tannewitz METAL CUTTING BAND SAWS

Variable Speed

Models to fit Every Need

In addition to our regular High Speed Band Saws delivering over 2 miles of smooth vibrationless saw travel per minute, which have proved so exceedingly popular in automotive and aviation work, the TANNEWITZ line now offers five other models to provide the fastest cutting medium for every foundry need: a 30" machine available in any 3:1 speed variation from 100:300 or 1000:3000 blade feet per minute—a similar machine with 3-step V-belt drive to give 2300, 3100, 4000 blade feet per minute—a 36" machine with 32" capacity under the guide—a model with 48" wheels and one with 52" wheels, operating at 3,000 blade feet per minute for handling extra large castings. Get a line on the TANNEWITZ metal cutting band saw that fits your particular needs. It will save time, step up production and repay its cost dozens of times. Write for full particulars NOW!

THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN

San Francisco Iron Foundry, San Francisco; secretary-treasurer, George L. Kennard. Directors elected to serve a 2-year term are: R. W. Goldwater, Industrial Supply Co., San Francisco; M. W. Hulse, General Metals Corp., Oakland, Calif.; Charles Hoehn Jr., Enterprise Engine & Foundry Co., San Francisco; F. A. Mainzer, Pacific Brass Foundry, San Francisco. A. R. Linn, Joshua Hendy Iron Works, Sunnyvale, Calif., was elected a director for a 1-year term.

Charles J. P. Hoehn, senior past president, presented retiring President Mainzer with an electric clock. Mr. Mainzer closed the meeting after introducing Hugh W. Davies, chairman of the entertainment committee. Mr. Davies had arranged an entertainment program which preceded the evening of dancing. —*George L. Kennard, Secretary-treasurer.*

Western New York

ANNUAL meeting and election of officers for the ensuing year for the Western New York Chapter of the A.F.A. was held June 25 at Hotel Buffalo, Buffalo. There were 200 members and guests in attendance, with Chairman Ralph T. Rycroft, Jewell Alloy & Malleable Co., Buffalo, presiding.

The meeting was opened with reports presented by chairmen of various committees, including: Martin W. Pohlman, treasurer; Harold J. Struebing, membership; William S. Miller, war problems; Reinhold D. Loesch, cupola research; Frank E. Bates, program. Chairman Rycroft thanked each one for the good work they had done during the year.

The following names were submitted by the nominating committee for election: Chairman, Frank E. Bates, Worthington Pump & Machinery Co., Buffalo; vice chairman, Reinhold D. Loesch, Lake Erie Foundry Co., Buffalo; secretary, J. Ralph Turner, Queen City Sand & Supply Co., Buffalo; treasurer, Martin W. Pohlman, Pohlman Foundry Co., Buffalo.

Directors elected to serve a 3-year term: Charles O. Burgess, Union Carbide & Carbon Co., Niagara Falls, N. Y.; Martin J. O'Brien, Symington-Gould Corp., Depew, N. Y., Frederick J. Wurscher, Acme Steel & Malleable Iron Co., Buffalo. Retiring chairman Ralph T. Rycroft was elected a director to serve 1 year as was Henry F. Sproull, A. P. Green Fire Brick Co., Buffalo, to fill the unexpired term of J. R. Turner. Since there were no further nominations, the slate was elected unanimously.

Director James E. Yates, Worthington Pump & Machinery Corp. presented the new chairman, Mr. Bates, with a gavel which was a gift from his fellow A.F.A. members at Worthington. Mr. Bates announced that an invitation had been issued to the American Foundrymen's Association to hold its 1944 congress in Buffalo and that the matter was under consideration by the national board of directors.

The meeting was concluded with an entertainment program.—*J. Ralph Turner, secretary.*

Quad-City

ANNUAL picnic and outing of the Quad-City Chapter of the A.F.A. was held June 19 at Farmall Club near Rock river, Moline, Ill. Golf at Short Hills Country Club occupied the morning, and the sports program and social sessions started at 2:30 p.m. Fish and chicken dinners were served to 422 members and guests during the late afternoon, followed by a floor show in the evening.

This event concluded the current season's meetings. The 1943-44 year will start with the meeting of Sept. 20, at which time the new officers and directors will assume their responsibilities—*H. L. Creps, secretary-treasurer.*

National Association of Manufacturers, New York, recently has published a booklet containing reproductions of 70 morale-building posters chosen as truly representative of our war effort. The posters were chosen from approximately 1000 submitted by 700 firms in the nation. Complete data is given with each reproduction including availability of the poster ideas to other companies.

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Just off the press is this new Lanly catalog illustrating, in addition to foundry ovens, an extensive and varied line of general industrial equipment for heat-treating, drying, baking and processing.
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MEN OF INDUSTRY

(*Concluded from page* 118)

beginning in the sales department in 1911. He was made sales agent in 1922 and works manager in 1929. Mr. Wasson will be succeeded at Indianapolis by **R. S. Davis,** assistant manager of that plant since 1929. Mr. Davis joined the Indianapolis works in 1917 as a draftsman, immediately upon being graduated from Rose Polytechnic Institute.

W. M. Ewing has been elected manager of National Malleable's plant at Sharon, Pa., succeeding Walton L. Woody, who recently was named vice president at Cleveland. Mr. Ewing is a graduate of Pennsylvania State College, and joined the company in 1919 with the melting department at the Cleveland works. He spent 1926 at the Chicago plants, returning to Cleveland to remain there until 1938, when he was transferred to Sharon as general superintendent.

Joseph O. Houze, since 1926 manager of the Cicero works of National Malleable & Steel Castings Co., has retired. Mr. Houze, who has been in ill health, completed 40 years with the company on Jan. 22, having joined it in 1903 at Indianapolis. Specializing in labor relations, he was transferred to the general offices at Cleveland in 1920 as general personnel director, remaining there until he went to Cicero. **Houston L. Hiatt,** sales manager of the Cicero works, also has resigned. The greater part of his 44 years with the company was spent as salesman and sales manager of the Chicago district plants.

♦ ♦ ♦

Fred I. Merrick has been elected chairman of the board of Standard Horse Nail Corp., New Brighton, Pa., succeeding the late John D. Bruhn. **G. B. Sheers,** formerly vice president and general manager, has become president and general manager. Other new officers include **R. S. Merrick,** vice president, and **C. K. Kennedy,** assistant secretary-treasurer. **U. S. Couch** and **A. L. Bingham** have been re-elected secretary and treasurer, respectively.

♦ ♦ ♦

Macon P. Miller, for the past five years works manager Radford plant, Lynchburg Foundry Co., Lynchburg, Va., has been appointed personnel director, Whiting Corp., Harvey, Ill.

♦ ♦ ♦

David MacGregor has been appointed chief engineer, Edward Valve & Mfg. Co., Inc., East Chicago, Ind., with which company he has been associated in various engineering capacities since 1925.

♦ ♦ ♦

R. Elliott Maxwell, vice president and director, Whiting Corp., Harvey, Ill., has been appointed export manager with headquarters at 136 Liberty Street, New York. Prior to joining Whiting Corp. last year, Mr. Maxwell for many years was connected with Carnegie-Illinois Steel Corp., Pittsburgh.

♦ ♦ ♦

Walter Bonsack, chief metallurgist and director of research laboratories, National Smelting Co., Cleveland, was awarded the 1943 Charles B. Dudley medal of the American Society for Testing Materials at the recent meeting of the society held at Pittsburgh. The medal was presented in recognition of the outstanding merit and original research contributed in his paper, "Discussion of the Effect of Minor Alloying Elements on Aluminum Casting Alloys" and published in the August, 1942 issue of the A.S.T.M. *Bulletin*. Since 1927, when he came to this country, Mr. Bonsack has been affiliated with the National Smelting Co. His early technical training was obtained in Germany. He is active in the work of several technical committees of A.S.T.M., and also is a member of the American Foundrymen's Association, American Society for Metals, American Institute of Mining and Metallurgical Engineers, Society of Automotive Engineers, and Society of Military Engineers.

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WASHINGTON NOTES ★ ★ ★ ★

IRON casting requirements of the nation for construction and machinery will decline steadily through the remainder of this year, according to an estimate made by WPB. The total for 1943 is placed at 904,800 net tons, divided by quarters as follows: First quarter, 329,600; second quarter, 257,100; third quarter, 184,100; and fourth quarter, 134,000. This estimate includes all new construction, major alterations, additions and facilities. Of the total estimated consumption of cast iron, 770,900 will be needed for machinery and equipment and the remaining 133,900 tons for construction.

★ ★ ★

The foregoing figures of WPB on cast iron consumption appear far out of line. Total production of gray iron castings recently has been running a million tons a month despite a curtailment from the 1942 *rate because of manpower limitations. This means that if the WPB figure is correct some* 11,000,000 *tons of castings will be made this year for purposes other than construction and machinery—which doesn't add up in view of the large share of total consumption accounted for by machinery requirements.*

★ ★ ★

MAXIMUM charge for conversion of copper scrap and copper alloy scrap in toll transactions has been set by OPA at the difference between the ceilings for the scrap metal and the refined copper. For instance, a processor who converts scrap copper having a 9¾-cent ceiling into refined copper metal to be returned to the owners may charge no more than 2¼ cents.

★ ★ ★

Cereal core binder no longer is under price control by OPA. A ceiling formerly was provided by the General Maximum Price Regulation, but OPA decided it was too difficult to establish suitable controls and, anyway, the price of core binder has little effect on the cost of living. Some foundrymen are said to differ with OPA on the latter point.

★ ★ ★

CEILING prices on machine tools in the as-is condition have been reduced slightly. The maximum for machines built Jan. 1, 1936 or after now is 70 per cent of the March, 1941 price of an equivalent new machine. The percentage formerly was 75. Percentages for older machines are: 65 per cent for the vintage of Jan. 1, 1930 to Dec. 31, 1935; 55 per cent for Jan. 1, 1920 to Dec. 31, 1929; and 45 per cent for those built before 1920. Ceilings on rebuilt and guaranteed machines are unchanged. The wider spread between the as-is and rebuilt units is supposed to stimulate rebuilding.

★ ★ ★

Specific dollars and cents prices have been substituted for "freeze" prices on refractory products used as linings for metallurgical and industrial furnaces, the new prices being included in a new OPA price regulation, MPR No. 416. *Formerly the ceilings on these commodities were fixed by a number of different regulations. The change does not disturb previously existing price levels.*

★ ★ ★

MAXIMUM prices producers of steel castings may charge for machining have been established by OPA under RPS No. 41 on the basis of the producers' machining rates of March 31, 1942 or on their base period costs and profit margin. If no rates were established March 31, 1942, the producer is required to submit a proposed price to OPA for approval. Charges for work let out to an independent shop are established on the same March base. Previously this schedule did not provide specific maximum machining charges.

★ ★ ★

Manner in which war production plants may qualify for the Army-Navy "E" is outlined in a pamphlet prepared by the

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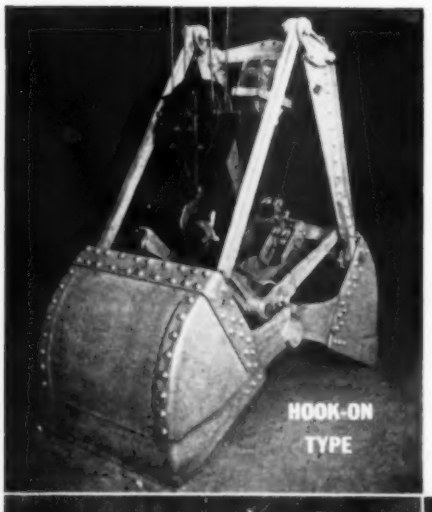

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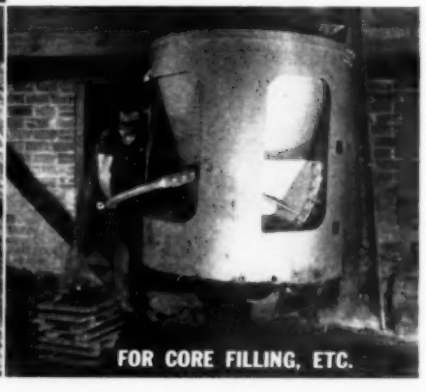


department of manufacture of the Chamber of Commerce of the United States, 1615 H Street, N.W., Washington. It tells of eligibility, selection of recipients, jurisdiction and procedure, and presentation ceremonies. Copies are available on request.

★ ★ ★

ORDERS for fans or blowers now require a rating of AA-5 or better. This minimum rating—specified under Order L-280—also applies to repair parts, except for those costing $500 or less for any single fan or blower, or 50 per cent of the original sales price of the unit to be repaired, whichever is less. Also exempt are small fans for furnaces.

★ ★ ★

Industrial facilities provided for purposes of war production since June, 1940 cost more than 20 billion dollars. By contrast, the cost of all new construction, both private and public, in the five years 1932-36 totaled only a little over 17 billions.

★ ★ ★

MAXIMUM prices of ferrosilicon and silicon metal have been placed on a dollars-and-cents basis. This represents little change from previous levels which were based on prices in effect between Oct. 1 and 15, 1941. A new zone system also has been established, resulting in different prices for delivery in various sections of the country.

★ ★ ★

Buyers of calcium carbide no longer are required to obtain specific authorization from WPB to obtain delivery, provided their receipts in any one month do not exceed 10 tons. Larger lots still require authorization.

★ ★ ★

RECENT changes in aluminum ingot prices reduce the maximum on secondary ingot by 1 cent to 14 cents a pound, the same as primary aluminum. A new classification (17S, 18S, 32S and 52S) consisting of ingots made from segregated plant scrap has been established at 14½ cents. Aluminum scrap prices generally have been reduced 1 cent below previous levels.

★ ★ ★

Another development in aluminum ingots is the setting of maximum prices on primary grade aluminum ingot—a new grade made by blending from 50 to 70 per cent of scrap with primary metal. New ceilings are: 15½ cents per pound for No. 142 and No. 355 and 15 cents for No. 195. The blended ingot is said to be comparable in every respect with ingot produced solely of primary metal.

★ ★ ★

ENFORCEMENT of the order requiring metalworking plants to segregate alloy steel scrap is being pushed by WPB. Somewhat loose observance of this order is causing loss of considerable amounts of alloying materials. Foundries have been asked to initiate a continuing survey of receipts of scrap, particularly carbon and alloy turnings, and to report any incorrectly classified receipts, including the car number, shipper, date, and analysis, to the Scrap Section of the WPB Steel Division.

★ ★ ★

Fluorspar prices have been increased approximately $5 a ton as part of a move to increase output and to aid in development of new mines. The War Labor Board previously had approved wage increases for fluorspar workers in the Illinois-Kentucky district in an attempt to prevent their moving to higher-paying jobs in war plants.

★ ★ ★

SOME aluminum foundries are accepting orders in excess of their capacity to make required delivery, according to WPB. Under CMP, foundries are not supposed to take orders in excess of 105 per cent of their capacity, but some plants are using an inaccurate capacity figure because curtailed labor supply has cut potential production. In such cases the order load should be based on the revised capacity rather than the ideal one figured under full operations.

★ ★ ★

Aluminum foundries also have been reminded that they are required to report to WPB all orders undelivered more than 30 days after the end of the requested month of delivery. Specific authorization by WPB is required to ship on such orders.

W. G. G.

THE LAST DROP IS AS GOOD AS THE FIRST

ASK THE MEN WHO USE IT!

You NEED good Core Oils to assure maximum efficiency in these days of urgent war activity. DAYTON OILS have stood the test for nineteen years. Their quality never varies. Can you afford less? Write for samples and proof.

THE DAYTON OIL COMPANY • DAYTON, OHIO

MAKERS OF DOCO BINDER & CORE PASTE • DOCO STEEL CORE & MOLD WASH

FOUNDRY COMMENT

MANPOWER rapidly is becoming the most pressing problem of the foundry industry. Because a sufficient supply of workers is not available, certain classes of castings are not being produced in large enough quantities to meet war demands. Unless there is an immediate change in attitude on the part of official Washington, the situation promises to become considerably worse.

Foundries throughout the country have lost large numbers of skilled and semiskilled men to the armed forces. At the same time workers have been lured away from foundries by manufacturers of other types of materials, who may be privileged to pay higher wages or, because of the nature of the operation, are able to provide better working conditions.

Common labor is practically unavailable. Therefore, many foundrymen are finding it necessary to use the remaining skilled workers for overtime periods at high wage rates for such tasks as unloading iron, cutting sand, shaking out, etc. Men are being worked long hours and are becoming tired. The scrap loss in many plants is mounting, and under present conditions, management sees little chance for improving the situation.

Long working hours has made absenteeism a most pressing problem. The War Manpower Commission seems to recognize the existence of this problem, but any assistance in seeking a solution has been confined to conversation and the screwball ideas that only complicate the situation and add to the headaches of the foundry manager.

An example of this developed in Cleveland several weeks ago when Dr. William P. Edmunds, Cleveland area director of the War Manpower Commission, held a meeting of foundrymen and union representatives to discuss absenteeism. The labor representatives present expressed the opinion that in the main, the manpower shortage among foundries was due to the disparity in wages in the Cleveland district. These representatives urged that the local WMC bring the situation to the attention of the War Manpower Commission in Washington, and that action be taken to provide relief. The Cleveland director pointed out that the local offices of the WMC have no authority in such cases except to make suggestions.

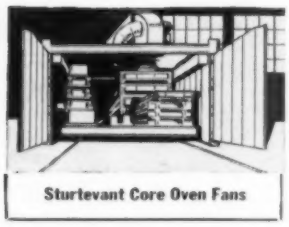
Prescribes Sure Cure

And then the doctor made his prize suggestion. With all the fervor of an evangelist, he earnestly advocated the serving of beer and pretzels in midmorning and midafternoon as the best cure for absenteeism. Pretzels were added because they provide salt which is needed by workers in the hot metal industries during the summer months. Evidently the doctor has forgotten that scientifically developed salt tablets now are available to workers in many plants.

Several reporters were present and the *Cleveland Plain Dealer* the following morning carried a front page story under the heading "Free Beer Urged For Foundry Help." The first two paragraphs of the story were as follows:

"Free beer and pretzels for foundry workers was earnestly advocated yesterday by Dr. William P. Edmunds, Cleveland area director of the War Man Power Commission, as one means of reducing absenteeism and turnover in the foundry industry, the shortage of labor which stands today as the No. 1 bottleneck in the war production here.

"Saying he spoke as a physician, Dr. Edmunds asserted every foundry and smelting works should provide a mug



Sturtevant Core Oven Fans

AND . . . down they stay, safely below 200 deg. F., on the Sturtevant Planovane Fan. Why? Because this fan has a special "heat slinger" which controls the temperature of the fan shaft bearings. It's a small extra fan mounted on the main fan shaft . . . that draws heat from the shaft, yet costs nothing to operate. Eliminates the need for water-cooling, and it's safer, surer. Protects against production delays or fire hazards due to over-heating.

The Sturtevant Planovane high temperature fan operates effectively when handling dirty air, is therefore especially useful for core ovens, for mold drying and heat treating.

Here's what it offers you:

1. Dependable, continuous service.
2. Smooth air flow.
3. Low power costs.
4. Slower operating speeds.

Also available with special wheels for handling explosive gases or corrosive materials. Engineering cooperation and performance data on request.

B. F. STURTEVANT COMPANY • Hyde Park, Boston, Mass.

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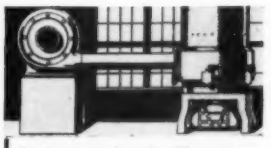
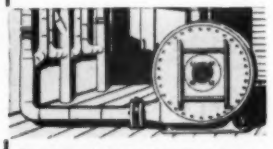
Puts Air to Work

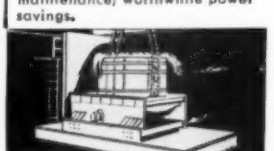
OTHER STURTEVANT PRODUCTS *tailor-made* FOR YOUR INDUSTRY



Sturtevant Cupola Blowers—assure smooth, constant pressure supply of air. Compact, simple, sturdy construction; sizes and types for all conditions.



Sturtevant Compressors—hold air pressure constant, in supplying blast to oil or coke burners. Lifetime efficiency, minimum maintenance; worthwhile power savings.



Sturtevant Foundry Shake-out Systems—completely control dust and fumes, increase worker efficiency and equipment life, cut down maintenance.

Sturtevant Dust Control—pioneer experience in engineered systems for collecting dust from snagging, tumbling and sandblasting operations.

Sturtevant Fume Control—efficient tailor-made systems for production foundries or low-operating-cost equipment for jobbing shops.

of beer and pretzels at midmorning and midafternoon for employes, to relieve fatigue, offset perspiration and raise morale."

The doctor's suggestion immediately stirred up a controversy. The following morning after the articles had appeared in the daily papers, reports indicate that several foundry managers were greeted with demands by union officials for free beer at once. A representative of the government had advocated free beer and pretzels and those on the receiving end were all too willing to misunderstand the suggestion as an official order.

Foundry management, although anxious to find methods of curing absenteeism felt it necessary to point out the accident hazards which might follow the adoption of the doctor's suggestion.

After the discussion had continued in the public prints for several days, the *Cleveland Press* summed up the situation in the following editorial, and at the same time gave the Cleveland area director a much deserved verbal spanking:

Beer, Pretzels, Talk, Etc.

Newspaper editorial pages are always making suggestions to other people about how to run their business. Fortunately, however, nobody assumes that our free and easy advice carries any official weight.

When Dr. William P. Edmunds sounded off with a suggestion that foundries serve free beer and pretzels in midafternoon, some thirsty workers thought he was speaking with the voice of law. The word spread that "the Government" had ordered the boss to rush the growler. Dr. Edmunds is district chief of the War Manpower Commission.

As a matter of fact, the question of what if any refreshments the boss should serve is somewhat beyond the edge of Doc's jurisdiction, and he himself hastened to explain that he was merely making conversation with good intentions.

There can be no doubt about the therapeutic value of the salt on pretzels, or salt otherwise provided, to people working in hot occupations. It is provided in most plants. Doc Edmunds seems to think that it would be consumed more readily if washed down with beer. He thinks the beer would be good for what ails you, too.

As to the therapeutic value of midafternoon beer, there is less unanimity. One school inclines to the notion that beer is relaxing rather than stimulating, and to some it is. Others argue that a small amount, not likely to affect most people, tends to make certain individuals inaccurate in the control of their muscles. And some folks who oppose alcoholic refreshment any time, any place, are against beer on principle.

For all these reasons, we do not expect to see free beer become universal in Cleveland's hot shops.

Maybe a man exercising real authority in one field should not give out too many remarks about things in a field so close that the border line may not be clear at all.

All of this has its amusing angles, but it does not help the production of castings. If the armed services are to have the castings required for almost every type of materiel, some definite action must be taken by the War Manpower Commission to permit foundries to secure a sufficient supply of ordinary labor as well as skilled and semiskilled help. As one good friend of the industry has put the problem, "it will do no good to have a huge army which can be neither clothed nor equipped".

F. G. S.

Book Review

Technical Handbook, by Edward H. Lang, supervisor of industrial education, New York State Education Department, paper, 110 pages 5 x 8 inches, published by Prentice-Hall Inc., New York, price, $1.

This book covers the application of mathematics and science to the industrial job, with essential tables for shop or engineering use and includes use of slide rule, logarithmic and trigonometric tables, reference tables on materials of industry, English-metric conversion, squares and square roots, cubes and cube roots, methods of solving problems.

A DOUBLE ADJUSTMENT

With a Single Action!

You will prefer the MARSCHKE FLOOR STAND GRINDER With UNIVERSAL GUARD wherever you can use a medium sized heavy duty grinder with direct drive single wheel speed. You will be pleased, particularly with the patented Marschke Universal Guard because it is so constructed that the spark shield—over wheel opening—is brought automatically into proper relation with the wheel whenever the work rest is moved to follow wheel wear. The double adjustment resulting from a single action makes for speed and convenience of operation . . . and even more important, it makes for safety without worry as to whether operator has neglected the spark shield adjustment. This single adjustment is made with permanently attached handles and screws—eliminating lost time looking for and applying wrenches.

Distance between wheels and between base and wheels provide clearances for handling long and irregularly shaped work pieces.

Its four bearings are well supported upon the massive base to assure permanence of accurate alignment—with true, smooth spindle rotation which gets maximum use out of high priced wheels.

Yes, you will like this Marschke Floor Stand because it is safe, speedy, versatile and dependable. Write for Catalog to . . .

VONNEGUT MOULDER CORPORATION

1839 Madison Ave., Indianapolis, Ind.

THE MARSCHKE LINE

FOUNDRY DEVELOPMENTS
At short range

IN A SPEECH given recently in the Canadian House of Commons, Lionel Chevrier, parliament-assistant, Minister of Munitions and Supply, pointed out that the bipod assembly on the Boys antitank rifle was redesigned to be made from a malleable iron casting instead of from a steel forging, steel tubing and bar stock. Annual saving by that procedure has been estimated at 771,600 pounds of steel forgings; 72,000 pounds of seamless steel tubing; 164,500 pounds of bar steel; 477,600 hours of labor and 77 machine tools. Savings amount to $1,780,000. A track sprocket originally rough flame-cut from steel plate and partly finish machined all over, now is centrifugal steel casting on which the only machining is the boring of the shaft hole and the drilling of a few small holes. Annual savings in plate stock is nearly 9,000,000 pounds; 725,000 hours in labor have been saved, and the total saving can be valued at $1,700,000.

♦ ♦ ♦

To save on strategic materials and to speed production the wheel hub of a 25-pounder gun carriage made in Canada formerly a steel drop forging machined all over is now cast closely to shape in malleable cast iron, and weighs only 31 pounds. The design is said to require less machining time due to easier cutting. It also is claimed that at capacity production the change saves 740,000 tons of steel; 35,000 hours of labor; two lathes and $310,000. Nose of the famous Valentine Mark VII produced in Canada originally was made from 14 pieces of armor plate, 11 pieces of mild steel plate, 1 bullet-proof drop forging and bullet-proof rivets and bolts. Those were assembled after close machining to secure perfect fit on all critical joints. Now the nose is a machined, 1-piece armor steel casting. Better field performance was secured with the new design due to improved contours, and savings in annual production are said to represent 205,000 man-hours, freeing of 21 machine tools, and $75,600 in cost. In a similar manner the turret constructed originally of 3 pieces of cast armor steel, 2 pieces of formed armor steel plate with machined fits and assembled with bullet-proof bolts now is composed of a 1-piece machined, armor steel casting. Breech ring of a 3.7 antiaircraft gun manufactured in Canada formerly made of a massive forging was redesigned as an intricate steel casting which is machined and tapped. Savings on current production are estimated at 2,750,000 pounds of steel, 100,800 man-hours, and $1,094,400 in cost.

♦ ♦ ♦

Production time has been reduced to a material extent in a prominent Eastern steel foundry where stern frames and other large castings are molded in cores instead of in the floor or in large flasks. The pattern is made in the usual manner and then cut into a number of sections. Each section is mounted in a corebox which then is filled with sand. When the required number of cores are baked, they

HAYNES

EQUIPMENT

BRASS FURNACES

TILTING OR STATIONARY

Simple cover-lifting mechanism, 2" cold rolled shaft, cast steel cross head, 3/8" rods and turnbuckles for adjusting cover. Made in any size required. 6" machined trunnions rest in chilled face bearings in the legs which are bolted to channel iron base braced with steel bars to eliminate side motion. Gear box and gears adjustable to take up any loose play due to wear. Furnace is complete welded shell equipped with special HAYNES burner designed to save nearly one-fourth your oil. Equipped with a General Blower unit.

HAYNES FOUNDRY EQUIPMENT CO.

1734 Lake Street — Kalamazoo, Mich.

LADLES — MOLDING MACHINES — CORE OVENS

are removed from the ovens and assembled in proper order on the level floor or a concrete lined pit. Practically all the sand is reclaimed and used repeatedly.

♦ ♦ ♦

In a nonferrous foundry where chills are used extensively, a simple and practical remedy was found for the small kicks or blows which sometimes accompany the use of these devices. One or two small channels in the face of the chill, either straight or in the form of a cross, apparently provide an exit for the gas or steam and allow the metal to lie quietly. Theoretically a chill should be perfectly clean and dry, when it is placed in the mold. However, in many instances especially where the mold stands for a considerable time before it is poured, or where the surrounding sand is at a higher temperature than the atmosphere, a slight amount of moisture is condensed on the face of the chill. The grooves in the chill face constitute a precautionary measure to cope with these hazards or contingencies.

♦ ♦ ♦

ON A 3-foot diameter casting where several vertical cores had to be set with the most extreme accuracy with relation to each other, difficulty was experienced in securing this accuracy with the ordinary green sand core prints. The problem was solved by placing a large dry sand core on the drag face of the pattern and then ramming up the drag in the usual manner. When the pattern was withdrawn later, the rigid core prints guided the vertical cores accurately into place. In this instance hundreds of duplicate castings were required.

♦ ♦ ♦

Highly satisfactory service is claimed for a floor topping material composed of 2 parts well balanced emery aggregate and 1 part portland cement. This material presents a compressive strength of over 14,000 pounds per square inch and a tensile strength of well over 1000 pounds per cubic inch. Old concrete floors topped with ¾-inch thickness of this material withstand the heaviest kind of trucking or abuse and are perfectly safe even when wet. Experimental floors laid in aluminum and magnesium foundries are impervious to the effects of molten metal.

♦ ♦ ♦

Production of a cast iron frame for a newly designed stitching machine presented an interesting problem to one foundry. The casting was designed to be gated on the inner or tension surface of the frame. The section was developed with proper consideration of metal flow into the mold and progressive change from thin to heavy sections. Contrary to foundry experience and design expectations, the castings were found to be closing, that is to say, the neck and the base of the frame were coming together rather than spreading apart as might be expected normally. After changing the gates and risers to no avail and after having three castings leave the molds identically, the pattern was distorted to compensate for the error. Identical castings now are obtained from the modified pattern; the castings being given a 25-hour cooling period in the mold.

♦ ♦ ♦

A recently developed magnesium-base alloy which according to the patent description is claimed to possess excellent yield and tensile strengths, and good formability (ductility) contains from 3 to 12 per cent thallium and 0.1 to 0.3 per cent cerium. The cerium is added in the form of misch metal which contains in addition to cerium, lanathum and other rare earths. While the alloy is designed primarily for rolling into sheets and other forms, it is said that it may be employed for castings and forgings.

♦ ♦ ♦

According to *Magnesium Scrap Book* of the Fisher Furnace Co., Chicago, complete combustion of oil requires 20 to 30 per cent excess air. That does not hold for gas as no atomizing action is required and excess air tends to reduce pot and lining life through oxidation. Correct burner design and installation will help to conserve fuel and equipment as well as to avoid accidents and lost time.

E. B.

MOUNTED WITH COOLING UNIT

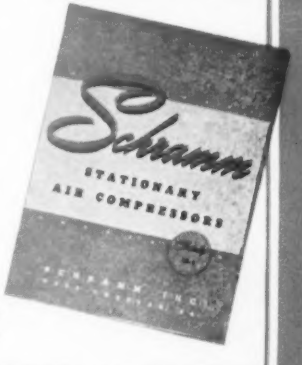
JUST LAY IT ON THE FLOOR

and hook up to current and air lines . . . . . .

In spite of the fact that the SCHRAMM Compressor unit shown above comprises motor, compressor and radiator, it actually is a "one-piece job". All are assembled rigidly and in perfect alignment on a substantial steel base which can serve as a vibrationless foundation. No belts, pulleys, flywheels or water connections are necessary.

If it's a Schramm you can pack a 600 cu. ft. per min. job into a space measuring only 90 ins. x 37 ins. Schramm's vertical, in-line design makes it a neat, compact package, for heavy and continuous service . . . Motor controls for the required starting current and torque can be furnished as a part of the unit or for remote installation . . . Sizes range from 50 to 600 cu. ft. displacement at 100 lbs. pressure.

Schramm Water-Cooled Air Compressors can be depended on for outstanding performance and satisfactory cooling under all temperature conditions, summer or winter, because water jackets completely surrounding cylinders and heads assure uniform cooling.



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SCHRAMM INC.

THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

FOUNDRY ACTIVITIES

LUFKIN Foundry & Machine Co., Lufkin, Tex., received the Army-Navy "E" at ceremonies held before several thousand persons on June 24. Walter C. Trout, president, accepted the flag, and Warden Ragland, veteran foundry worker, represented the employes in receiving the "E" pins. Specializing in peacetime in manufacture of oil field pumping equipment, the company has been making ship and tank gears, truck-trailers and gun carriages for war purposes, and other miscellaneous castings.

° ° °

National Malleable & Steel Castings Co.'s Indianapolis works received the Army-Navy "E" award on June 25. The flag and "E" pins were accepted by Stowell C. Wasson, manager of the Indianapolis works, and Jack Holt, secretary-treasurer of U.A.W. Local 761, C.I.O. Presentation was made by Lieut. Col. George M. Enos, Cincinnati Ordnance District, and Lieut. Richard Morey Jr., naval adviser to the War Production Board.

° ° °

Goldens' Foundry & Machine Co., Columbus, Ga., was the recipient of the U. S. Maritime Commission's "M" pennant, the Victory Fleet flag and merit badges at recent ceremonies. Col. Willard F. Rockwell, of the Maritime Commission, made the awards which were accepted by Arthur G. Springer, plant production expeditor, and D. O. McSwain of the erecting department.

° ° °

James B. Schumacher and George A. Euskirchen, as general partners, will continue to operate the gray iron foundry under the firm name of Cincinnati Foundry Co., 238 West Mitchell Avenue, Cincinnati. Mr. Euskirchen succeeds the late George C. Euskirchen, his father, who died Feb. 8 after having been associated for 30 years with Mr. Schumacher, as a general partner.

° ° °

Westalloy Aluminum Foundry, 1641 East Slauson Avenue, Los Angeles, is the firm name under which J. S. Biddle and V. F. Schaap have published an intention to conduct business.

° ° °

Atlas Pattern Works, formerly located at 3001 West Carroll Avenue, Chicago, has purchased a one-story building at 4530 West Harrison Street, Chicago, to provide additional space.

° ° °

Index of new equipment orders for May, according to a report of the Foundry Equipment Manufacturers Association, Cleveland, was 274.3 as compared with 297.7 in April. Index for repairs was 573.7. Index of 100 represents the monthly average of reported sales to metalworking industries during 1937-38-39.

° ° °

Fisher Brass Foundry, 5332 Santa Fe Avenue, Los Angeles, has awarded contract for construction of a new building, 52 x 100 feet, to cost $11,000.

° ° °

Michigan Aluminum Castings Co., 200 River Street South, Ypsilanti, Mich., has been incorporated by J. G. Krause, 695 East Grand Boulevard, Detroit; Dale S. Clark, 27770 Northwestern Highway, Birmingham, Mich., and Mason C. Briggs, Rochester, Mich.

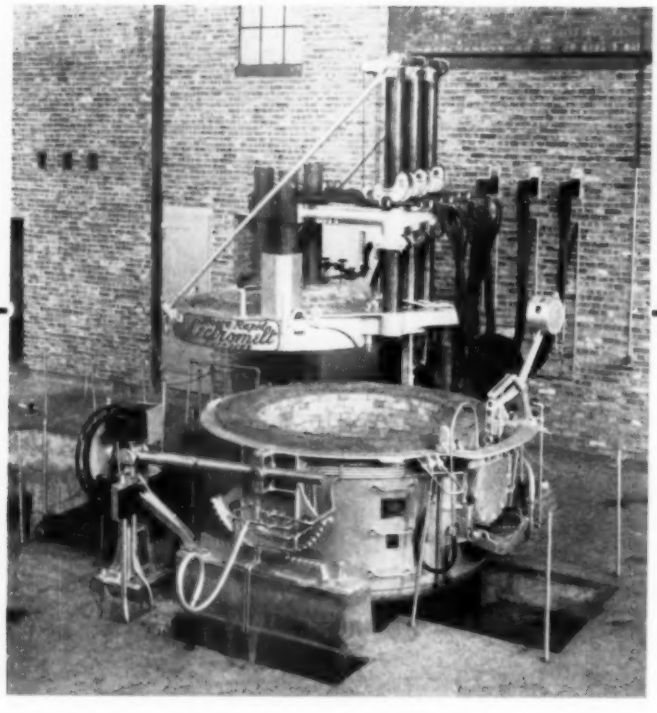
° ° °

Art in Bronze Co., Cleveland, suffered $12,000 damage by fire on June 23. The foundry was not damaged, the fire being confined to the smelting department.

° ° °

Paris Foundry & Machine Works, Paris, Ill., experienced a fire June 8 which caused several thousand dollars damage. A short in the electric wiring was blamed for the fire.

Now WHEN MORE STEEL IS NEEDED . . .



. . . is the time to consider Lectromelt top charge furnace for the fastest production of high alloy steel.

By hydraulically lifting and swinging the roof, Lectromelts can be charged quickly and easily by drop bottom bucket. Illustrated is a 2 ton per hour top charge Lectromelt with roof swung ready for charging. Write for complete information.

PITTSBURGH LECTROMELT FURNACE CORPORATION
Pittsburgh, Pennsylvania

Avoiding Extremes in

USE OF MOLD WEIGHTS

By JAMES A. MURPHY
James A. Murphy & Co.
Hamilton, O.

IN THE early part of this century, a large foundry was built for the production of heavy castings. After about four years of scrambled effort, when the company had progressed a considerable distance toward the ragged edge, the management hired an alert young foundryman of fair educational attainments, a world of experience and plenty of guts. In less than 60 days he turned the shop from a loss to a profit and kept it that way until he departed for more congenial clime, or maybe climb.

Aside from the cranes and cupolas which were all first class, the principal operating assets of this plant included a variety of badly constructed wood and iron flasks; a selection of loam plates, worse than the flasks; a large tonnage of almost unbreakable bad castings and last, but by no means least, over 300 tons of weights for holding-down purposes. These weights were looked upon not alone as a very valuable operating asset, but as an indispensable array of rigging without which it would be impossible to operate. There was no visible evidence that anyone ever heard of a bolting-down pit or floor. Even clamps were not much in evidence. Weights to some extent are a convenient and almost indispensable convenience in a jobbing shop, but like other good things much abuse is practiced. The cheaper, quicker and more secure methods such as clamps and bolting down devices are neglected.

Weights Are a Make-Shift

As a means of counteracting the buoyancy of large copes on pits, weights are neither safe, secure nor scientific. At best they are a make-shift and represent the most costly method measured by time and material for the accomplishment of the desired end and in addition, their use often has been destructive in practice.

This was the philosophy of the young man referred to. Melting down these 300 tons of weights and other superfluous dead assets, pouring the metal into profitable commercial castings, and doing it quickly, was largely responsible for saving the owners from a humiliating bankruptcy. Instead the company was placed in a sound financial condition. Even with this enormous amount of weights at command, a certain genius of the old, very old, school and who was largely responsible for the sand condition, insisted on placing as much weight as possible into the cores to assist in keeping them anchored. This was considered Safety-First practice.

For example, a large drum core, containing 63 tons of plates, rings, bars and rods was so heavily weighted that the crane cables parted. Mold and core were destroyed. Two men were killed and three severely injured. Through a more practical procedure the supporting members of this core were reduced to 11,000 pounds and the whole mold itself bolted down by proper anchoring methods. No weights were used, for none was necessary. Under the old method with plenty of weights, 11 months were consumed without producing one acceptable casting. Without weights in either core or mold, one casting per week was produced until the order was completed. This may look like an extreme case. It is, but it is absolutely true without the slightest trace of exaggeration. I have known many others that are close relatives. Incidentally, that was not the only heavy work shop that turned its weights into commercial castings about that period, because this particular incident was not concealed or in any way considered confidential.

A paper presented at a recent foundry meeting was illustrated by pictures showing several steps in the production of a

PRECISION
HYDRAULIC TESTING MACHINE
with Pendulum
Load Indication

MORE ACCURATE, MORE DEPENDABLE FOR PRODUCTION TESTING BECAUSE:

Pendulum load indicator operates on the natural laws of gravitation.... This principle of operation is not affected by temperature changes or subject to metal fatigue. . . . *Write for descriptive literature and quotations.*

ARMY E NAVY

RIEHLE
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Division of
American Machine and Metals, Inc., East Moline, Illinois

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40-ton lathe bed. The large pile of weights on top of the cope amounted to over 200 tons. Why this vast amount of dead weight was required to hold down the cope of a casting that presented such a comparatively small surface to the cope, was not explained. The principal cores in a lathe bed are not floating. As it was stated that the mold was cambered ¾-inch, the factor of velocity or speed with which the rising metal strikes the surface of the cope at the same time would eliminate to a great extent the accuracy of any calculations governing the static pressure formula in such cases.

Some claims are made that the static pressure exerted in any mold may be calculated easily, quickly and accurately. The required amount of weight to counteract this pressure is a simple application by anyone acquainted with elementary addition. To say the least such statements are slightly overdrawn. They are not actually untrue but they are on the borderline of the problematical. The application I saw illustrated bears out this statement. At least 50 per cent or more of the weights applied was unnecessary, whether figured on the static pressure formula, displacement or dead weight tonnage reckoning.

I never did have, nor am I likely to have, any objections to the jerking of a few logarithms in the interest of trade, profession, or what have you; but the best I can say of mathematical formulas in such cases as holding down a cope with weights, whether the answer is in foot pounds, foot tons or common everyday pounds avoirdupois, is that it only helps to confirm a good guess based on practical experience.

In defense of this statement, if defense is necessary, there floats down my memory a mental injection I received several years ago from an old and highly respected steel mill manager in the Pittsburgh district for whom I made many important castings. I objected to the size of certain bolt holes, principally on account of the danger of the cores fusing. A highly practical man, he also expressed some doubts as to the size of the bolts. He called in the young man who designed what was in this case a very important machine base. The first question asked was "what factor of safety did you allow on these 1½-inch bolts?" The answer was "2". "What factor of safety would we have if you used 1¾-inch bolts?" The answer: "5, sir." "All right boy," said the old gentleman, "put in 2-inch bolts."

Consider the Crushing Item

This man had a well developed safety hunch and perhaps the man responsible for the excess weights on the lathe bed had the same. However, the matter of crushing is an item worth taking into consideration. Distribution of weights on top of a cope is of great importance. Uneven distribution often is the cause of crooked, warped and twisted castings that are mostly a dead loss. All the fires ever kindled for the purposes of straightening castings would be a failure with castings out of shape from this particular cause.

I am not unduly prejudiced against the use of weights in small or large sizes in limited quantities. They often serve a useful and necessary purpose, but my respect for them is not increased when I see an expensive crane tied up carrying weights about while molders and others are waiting for service. I have seen molders and coremakers so tired of waiting for crane service that they went to play cards or roll the bones while the crane or cranes were performing these operations of antiquity. It would seem that the cry for scrap reverberating from the throats of the industry, the resonant call of the all-out slogan for scrap and more scrap has in many cases fallen upon impaired hearing apparatus. The gold mines at home or in the vicinity are not recognized or thought about.

At the recent St. Louis convention of the American Foundrymen's Association, the subject provoked considerable informal comment. In the well-considered opinion of one testy old foundryman the owners of all these excess weights in times like these should have them hung on their necks. Actuated by a retiring and somewhat compromising disposition, I would not go that far, but I do think it may be a pious and patriotic act to sic the Boy Scouts on them.

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Numerous Factors Included in

SAND REFRACTORINESS

By FRED B. RIGGAN
Metallurgist
Key Co., East St. Louis, Ill.

DEGREE of refractoriness of a material generally is defined as a measure of its ability to withstand heat. However, in the foundry the author wonders whether or not it would be proper to broaden the definition to include the conditions under which a material withstands heat or would it be better to find some other term or terms that would express the ability of a sand to withstand heat under conditions of: 1. Reducing or oxidizing atmosphere. 2. Sudden or gradually applied heat. 3. Heavy or light stress. 4. Acid or basic slag forming tendency. 5. Other conditions such as metal turbulence and surface tension.

About 1922, P. G. H. Boswell (British and American Foundry Practice With Special Reference to the Use of Refractory Sands) stated that "The most successful steel molding sand contains from 1 to 5 per cent hydrated ferric oxide." There is a man who knows how to label the property of a sand that is most desirable! It would be interesting to know what particular defect would show up first as this oxide was removed from the successful sand. Refractoriness of a sand mold usually is considered in terms of whether the sand is burned on to the casting surface particularly the drag portions of heavy sections.

Iron Oxide Increases Strength

In most of our casting sections of 1 to 2 inches, although the mold surface may reach 2700 degrees Fahr., the highest measured temperature ¼-inch back from sand metal surface is 1700 degrees Fahr. The sand ¼-inch back does reach maximum expansion. Whether or not that expansion permits the ¼-inch of sand to stay in place or not has much to do with the high temperature problem. Base sand used in our foundry is not of the proper grain distribution to give the best expansion properties and might not work at all for large flat surfaces. However, we think that we get enough benefit from this type sand in the cores to outweigh the disadvantage. We have learned the hard way that a buckle which generally is attributed to a strong sand with high expansion, may be so severe as to cause a defect which looks exactly like a scab, which almost universally is attributed to weak sand. Iron oxide additions gave this particular core sand enough plastic strength to prevent disintegration of the surface.

We have some hot tear troubles on core resistance due to a 2½ minutes lag to maximum expansion and a 5 to 6 minute collapsing time, or it may be some other property which could be correlated further with our scrap castings. Hot strength measured at 2500 degrees Fahr. after soaking 12 or 20 minutes has helped a lot but some other factor is needed in addition to this. If the time-weight factor could be correlated with temperature and its influence on the expansion characteristics of the sand ¼-inch back from the sand metal surface we think that we would have what is desired.

It is interesting to note that one of the proposed research projects of the Steel Founders' Society of America as prepared by C. W. Briggs, problem No. 13 is "The development of molding sand that will have maximum acceptability at molten steel temperatures." The outline of this project states:

"Little information is available on the properties of various molding sands at elevated temperatures. Some sands develop high strengths at elevated temperatures which property may be conducive to the formation of hot tears in steel castings. Other sands have high expansion and contraction characteristics which

(*Concluded on page* 194)

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A. S. T. M. ANNUAL MEETING

(*Continued from page* 107)

Williams, Amherst College; S. L. Hoyt, Battelle Memorial Institute, Columbus, O., and J. O. Almen, General Motors Research Laboratories, Detroit. Various types of hardness determination apparatus were described; the most commonly used being the indentation, the scratch, and the rebound instruments. Each measures different properties, and measurements by one cannot be translated into terms of the other for all conditions and materials. However, while hardness tests cannot be expressed in terms of length, mass and time, they do serve an extremely useful purpose in control of materials. They indicate in like materials, that these have received certain processing or treatment which makes them suitable for definite applications.

In a session on corrosion and electrodeposited coatings held Wednesday morning with W. H. Finkeldey, Singmaster & Breyer, New York, and E. A. Anderson, New Jersey Zinc Co., Palmerton, Pa., as co-chairmen Sam Tour, Sam Tour & Co. Inc., New York, presented the report of committee B-3 on corrosion of nonferrous metals and alloys. This report included a new proposed method of total immersion testing of nonferrous metals, and information on the test specimens exposed for 10 years to atmospheric conditions in 9 different locations. Report of committee A-5 on corrosion of iron and steel included data on field exposure tests of wire and wire products. Papers presented at the session were "Total Immersion Corrosion Test", by W. A. Wesley, International Nickel Co., New York; "Atmospheric Corrosion of Copper", by A. W. Tracy, D. H. Thompson and J. H. Freeman, American Brass Co., Waterbury, Conn.; "Chromium Plate in Engineering Application", by T. G. Coyle, United Chromium Co. Inc., Detroit; "Properties of Plated Lead Coatings on Steel", by Gustaf Soderberg, Udylite Corp., Detroit, and "Use and Misuse of the Salt Spray Test as Applied to Electrodeposited Metallic Finishes", by C. H. Sample, Bell Telephone Laboratories, New York.

Committee Reports Progress

Report of committee B-5 on cast and wrought copper and copper alloys, presented by J. H. Foote, Commonwealth & Southern Corp., Jackson, Mich., at a nonferrous metals session on Wednesday afternoon, recommended inclusion of a reference to Tentative Specifications for Electrolytic Cathode Copper (B115-41T) in various other specifications including those on Bronze Castings for Turntables, Movable Bridges, Bearing and Expansion Plates (B22-40T), and Aluminum Bronze Sand Castings (B148-42T). The report also mentioned that one of the subcommittees has under consideration a proposed specification for copper-silicon and copper-silicon-zinc castings, and has prepared proposed emergency alternate provisions providing a cast-to-size test bar for a number of specifications relating to castings. Those will be submitted shortly to committee E-10 on Standards. Report of committee B-7 on cast and wrought light metals and alloys stated that one of the subcommittees is studying test bar mold design for sand-cast aluminum-base tension test specimens with the view of submitting a standard gating design.

Iron, steel and metallography were discussed at a session held Thursday morning under the direction of co-chairmen C. F. W. Rys, Carnegie-Illinois Steel Corp., Pittsburgh, and E. W. Upham, Chrysler Corp., Detroit. In presenting the report of committee E-7 on radiographic testing H. H. Lester, Watertown Arsenal, Watertown, Mass., pointed out that its most important work was the publication of *Symposium on Radiography* in book form. The committee has prepared terminology and symbols for interpretation of radiographs which will be submitted later on. It also has accepted Navy specifications and standards

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for indicating certain defects, and proposes to revise tentative specification E-15-39T on methods of radiographic testing of metal castings so as to form a book containing the principles, technique, equipment used, etc. for that work.

Report of committee A-10 on iron-chromium, iron-chromium-nickel and related alloys, presented by R. J. Painter, American Society for Testing Materials, mentioned that the group in co-operation with the Alloy Casting Institute was going to prepare tables of data on heat and corrosion resisting castings similar in context to that already published on wrought steels. Report of committee A-7 on malleable cast iron made by J. J. Kanter, Crane Co., Chicago, stated that it had developed an emergency specification for malleable iron pipe flanges, fittings and valve parts to replace critical copper-base parts, and that specification is part of the *Book of Standards* of the society. It also mentioned that the committee still is working on a proposed tentative specification for pearlitic malleable castings.

Recommended Practice Accepted

John W. Bolton, Lunkenheimer Co., Cincinnati, presented the report of committee A-3 on cast iron which mentioned that a new recommended practice for torsion tests of cast iron had been accepted and is published in the *Book of Standards*, and stated that the committee is interested in expanding the direct interest of independent producer and producer groups as well as consumers of cast iron. N. L. Mochel, Westinghouse Electric & Mfg. Co., East Pittsburgh, presented the report of committee A-1 on steel which mentioned that emergency alternate provisions for alloy steel castings for structural purposes (EA-A148a) had been established. Information on those were published on page 137 of the May issue of THE FOUNDRY. The committee also is working on emergency alternate provisions for carbon steel castings for valves, flanges and fittings for high temperature service (A95-41), and carbon steel castings suitable for fusion welding for service at temperatures up to 850 degrees Fahr. (A216-42T).

An interesting paper prepared by H. E. Montgomery and John Urban, Lunkenheimer Co., Cincinnati, on "Structure and Creep Characteristics of Cast Carbon-Molybdenum Steel at 950 Degrees Fahr." was presented by John W. Bolton in absence of the authors. It described results of creep tests on specimens of that type of steel which were treated to obtain pearlitic and acicular structures in fine and coarse grain material. The tests showed that coarse grain, acicular structure is the best in creep resisting properties and the fine grain, pearlitic is the poorest. Considerable information on the data obtained and their implications are described on page 182 of this issue as a part of "Foundry Metallurgy in the Castings Industry", by Mr. Bolton.

Weight Handling Is Pamphlet Subject

Advice on how heavy weights should be handled to avoid injuries to workers is contained in a pamphlet available from the Division of Labor Standards, U. S. Department of Labor, Washington. Called "A Guide to the Prevention of Weight-Lifting Injuries," the pamphlet covers fundamentals of lifting—planning and control of processes and work methods, selection and training of workers assigned to such duties, and the importance of continuing supervision. Recommendations were compiled by safety experts, plant physicians and personnel officers of industry.

Book Review

Proceedings of American Society for Testing Materials; cloth, 1217 pages; published by the society, 260 South Broad Street, Philadelphia.

Volume 42 contains a record of proceedings of the forty-fifth annual A.S.T.M. meeting held at Atlantic City, N. J., June 22 to 26, 1942. It includes committee reports on metals, constructional materials, and miscellaneous materials, as well as technical papers presented at the meeting. Contents are indexed by subject and by author.

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FOUNDRIES NEED TEMPERATURE CONTROL

(*Continued from page* 95)

a sound casting. This is not good practice although many foundrymen like to pour metal as cold as possible.

Heavy gates and risers can cause internal shrinkage, draw holes, hot cracks, waste of metal etc., between the time the casting is poured and removed from the sand. Sound judgment will not sacrifice gating to increase yield, but good practice will establish a method of gating and risering to save metal and yet produce a sound casting. The speed with which the metal enters the mold cavity at a given temperature, with given gating and risering, determines to a great extent the soundness of the casting.

While the writer has advocated higher pouring temperatures he has always kept in mind the rate of solidification in determining pouring temperature. Good pouring temperatures for most red brasses and bronzes range between 2050 and 2200 degrees Fahr. with normal gating and risering.

All castings must not be poured at high temperature. There is a definite pouring temperature range at which a good sound casting can be produced with normal gating, and this can be determined by fracturing the first and last piece in the mold, or the first and last casting poured from the ladle. In many foundries it is not economical to go to this expense but in production foundries it is highly recommended.

Pouring temperature must be guided by the gating. Large gates will permit lower pouring temperature, but not under 2050 degrees Fahr. The poor feeding qualities of cold metal will produce a porous grain structure. Likewise, when metal is poured too hot through large gates, slower cooling takes place and porosity exists with a columnar grain structure.

Many foundrymen agree that the use of a strainer or skim gate or some method of choking the metal before entering the mold is good foundry practice. This is true especially where castings are made from 85-5-5-5 metal or with higher zinc and lead content alloy. Not only does the method help to keep back dross and oxides, but most important, it governs the flow of metal into the mold cavity and permits it to enter with the least amount of turbulence. For small and medium size castings the writer uses a combination strainer and skim gate. The strainer core breaks the drop in metal and the skim gate forces the metal into the cavity under pressure from pouring sprue. Best physical properties and soundness are obtained by pouring in this manner. Strainer and skim gates may be used on large castings but compensation for quick solidification at the strainer or skim gate must be provided in blind heads or risers.

Check the Temperature

Gating is the most important factor in setting up standard pouring temperature practice both from the economical standpoint and the rate of solidification. Where pouring is done from the crucible in which the metal is melted, the temperature is taken in the crucible while in the furnace to see that it is not overheated or soaking, and at the molding floor before pouring. When metal is poured from lined steel or iron ladles it is very important that these ladles be preheated to a bright red color before pouring metal into them. If pouring is continuous during the day, the ladles should be kept as hot as possible at all times, even keeping them under fire when not in use. After each pour the oxidized metal should be removed from the sides and bottom as soon as possible, so that it will not be absorbed in the next pot full of metal.

Pouring metal into cold or poorly dried ladles will not only vary the temperature but will cause moisture absorption and produce gaseous and open grain metal.

Type of pouring equipment depends upon the size and weight of castings to be poured. However, it is a factor to be considered because the time required to get metal from the furnace to the molding floor is important. The metal

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surface is exposed to the atmosphere and lining, and this exposed metal surface must be held to a minimum to get maximum results in sound metal. Pouring temperature should be taken at the molding floor and the metal should be stirred well before pouring. Phosphorus should be added to the bottom of the ladle to increase fluidity, about 1½ ounces per hundred pounds. Small or medium size red brass or bronze alloy castings never are poured at temperatures under 2100 degrees Fahr.

Number of molds and pieces poured between the highest and lowest temperature should be recorded and these castings should be followed through machining and to the final air or water test. Castings found porous at test should be broken, opened at the point of the porous section and examined to determine the cause of defect.

Core making, proper venting, good baking and control of molding sand have no direct connection with pouring temperature but have a direct bearing on the soundness of metal. Poor venting generates gas which becomes absorbed in the metal and produces open grain structure.

Prepare Sand Properly

Poor core baking and excess moisture in molding sand will produce holes under the surface of a casting and produce a coarse open grain structure with water vapor holes showing. Permeability of molding sand should be as high as possible to allow gases produced by the hot metal coming in contact with core and mold to escape freely. The sand should be properly bonded to absorb moisture and have sufficient strength to keep sintering point at proper level.

Defects due to incorrect pouring temperature can be determined by appearance of the grain structure. Open grain indicates hot metal, while close grain structure indicates good pouring temperature. A spongy or coke-like structure with discoloration indicates low temperature pouring. Shrinkage due to improper gating or risering and solidification of metal can be determined by grain structure. Shrinkage due to pouring hot metal shows an open columnar grain structure with reddish brown discoloration or worm holes near the gates. Shrinkage due to metal poured cold will show a finer grain and coke-like structure with reddish brown discoloration. Pouring temperatures of all castings should be recorded and ultimate results posted against that record for future reference.

It is not always economical to have a wide pouring range if metal can be handled and poured within a shorter range.

R-S Products Corp., Wayne Junction, Philadelphia, has issued a four-page bulletin containing complete dimension tables for butterfly valves operating at 15 to 125 pounds per square inch pressure.

Copper and Brass Group Elects

Robert L. Coe, vice president, Chase Brass & Copper Co. Inc., was re-elected president of the Copper & Brass Research Association at its twenty-second annual meeting at New York, June 23. Theodore E. Veltfort was re-elected manager and Bertram B. Caddle, secretary.

Other officers elected are: Vice presidents—Wylie Brown, president, Phelps Dodge Copper Products Corp.; John A. Coe, chairman, American Brass Co.; William M. Goss, vice president, Scovill Mfg. Co.; Curtis L. Smith, treasurer, National Copper & Smelting Co.; Herman W. Steinkraus, president, Bridgeport Brass Co. C. Donald Dallas, president, Revere Copper & Brass Inc., was re-elected treasurer.

York Ice Machinery Corp., producer of refrigeration and air conditioning equipment, has announced the company will be known as the York Corp. as a result of final court approval on a plan of merger and recapitalization. The change in name resulted from a merger with a subsidiary, the York Corp. The merger has no other effect on the company's operations, except for capital structure change.

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TREATMENT OF ALLOY CAST IRON

(*Continued from page 97*)

parts, usually are made of low-silicon, low-carbon irons alloyed with additions of nickel, chromium, molybdenum, and possibly vanadium, all in proper balance, so that carbide colonies are not formed or other undesirable ingredients introduced.

McCloud[6] has described the die composition employed for processing stainless steel into head lamps and radiator parts. For this purpose, an iron of approximately the following composition and treatment was used: Total carbon 3.25; silicon 1.25; manganese 0.45; nickel 2.00; chromium 0.70. When heated to 1550 degrees Fahr., oil quenched, tempered at 900 degrees and air cooled, the iron had brinell hardness of 286 to 321.

Actual results of quenching tests upon 3-inch thick sections are presented in the data of Table V and Fig. 5, prepared by Coyle[4].

The importance of compensating for the effects which constituents of cast iron have upon raising or lowering the "critical temperature" and thus affecting the quenching temperature is illustrated in Table IV presented in the July issue on Page 92, which shows how an unexpected increase in silicon, chromium and molybdenum contents raised the quenching temperature above the usual 1400 to 1450 degrees Fahr. level, and produced a softening.

When casting shapes are too complicated and irregular, or shop processes prevent the application of the more drastic liquid quenching, then air cooling may be applied to harden correctly-alloyed castings. The function of the alloys is to sufficiently retard the normal transformations, which in liquid quenching produce strengthening and hardening, to compensate for the slower rate of air cooling. Usually several per cent of alloys should be present, in proper balance. Thin-sectioned castings require considerably less of alloying than thick sections. In some cases, the air cooling of thin castings provides a degree of control that may not be obtainable in the mold, thus producing greater uniformity in the final product.

Castings, such as cylinders or plungers which are gated and fed from one end, or along a center line, may cool at an irregular rate due to the local pre-heating effect which incoming metal supplies to the mold cavity. Unless the alloy content is adequate to extinguish the effects of the difference in cooling rates upon the casting properties, it may be desirable to allow the casting to cool; then remove the offending gates or feeders, and finally apply an air-hardening heat treatment calculated to produce the properties desired.

Heated Above Critical

Hurst[7] illustrates the hardening effect of the air quench in Fig. 7. Castings are heated above their critical temperature (which for high alloy contents is relatively low) to 1450 to 1550 degrees Fahr., held long enough to acquire heat uniformly and thoroughly, then cooled in still air. Under carefully-controlled operating conditions, air-hardening may be practiced by interrupting the cooling in the mold, after solidification, and applying a carefully timed shake-out.

The hardening of alloyed irons by air cooling from 1700 degrees Fahr. is illustrated in Table VI.

Hot quenching is described as a process of quenching iron-base alloys in a medium, the temperature of which is substantially higher than atmospheric. The hot quenching treatment consists of heating to 1400 to 1600 degrees Fahr. and quenching in a hot liquid held at some predetermined temperature, such as 400, 600 or 800 degrees Fahr. The piece is then held in the quenching bath long enough to achieve the desired properties. A pronounced improvement in toughness occurs if the casting is held in the quenching bath long enough to achieve a hardness of 250 to 400 brinell. Usually a longer period, say 1 to 2

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hours at 500 degrees Fahr. is preferable to a shorter period at a higher temperature to produce the same hardness. Since the principal advantage of the treatment lies in the improved toughness obtained, irons inherently tough "as cast" are preferred for the treatment. Alloyed irons containing nickel or molybdenum alone or in combinations offer the best advantages.

Bartholomew[8] reported upon three alloyed irons whose composition and hardness after heat treatment are shown in Table VII.

Heat treated iron is machinable at hardness up to 300 brinell. The distortion is lessened, and the dangers associated with the quenching of complicated shapes which are liable to fracture are reduced considerably. Wear tests upon three cams which had been tested in the (a) "as cast", (b) quenched and tempered, and (c) hot quenched conditions showed that the performance of the hot quenched casting greatly excelled its quenched and tempered companion that had been heat treated to the same hardness.

In another test, a further indication of the wearing properties of hot quenched cast iron was obtained by mating hardened alloy steel rolls with cast iron rolls of the same composition, but subjected to different heat treatments.

The results showed that the wear resisting load which the hot quenched rolls were able to carry was multiplied 2 to 3 times over the "as cast" rolls.

Castings Heat Treated

Castings such as cams, wiping plates, clutch disks, cylinder liners, piston rings and small rolls and roller bearings were mentioned as parts susceptible to improvement if processed through the "hot quench" or isothermal treatment.

Nitriding is described as a process of case hardening in which an iron base alloy of special composition is heated in an atmosphere of ammonia or in contact with nitrogenous material.

After a heat treatment, castings are heated in nitrogen at 950 to 1000 degrees Fahr. for 60 hours to develop a case 0.010 to 0.015-inch deep, processing hardness of Rockwell N-79. Homerberg[9] reports a growth in this cast iron alloy 50 per cent greater than that exhibited in the corresponding steels.

Flame hardening is described as a process of heating the surface layer of an iron base alloy above the transformation temperature range by means of the flame of a high temperature flame, followed by quenching. By proper adjustment of the various factors involved, surface layers from 1/16 to 5/32 inch in thickness may be hardened, and the hardnesses produced may vary from 450-600 brinell, 45-51 rockwell "C", or from 65-82 Shore scleroscope, depending upon the method of measurement.

Gears, cams, machine tool ways, sheaves, rolls, sleeves, liners and dies are regularly flame hardened today on production schedules. Special equipment has been designed to treat these parts in the most effective and economical way.

Flame hardening operations may be divided into four classes as follow: (1) Spot hardening method. (2) Progressive method. (3) Spinning method. (4) Progressive-spinning method.

The first method is the most simple and can be accompanied by using a welding blowpipe with a single neutral flame. A small localized area may be raised above its critical temperature and immediately plunged into water.

The second method is most suitable for flame hardening flat surfaces such as machine tool ways or large gear teeth. The flame tips are mounted on a movable head, which also carries a set of water sprays immediately behind the flames. The water sprays are adjusted to such a position behind the flame that they quench the heated metal as soon as it attains the desired temperature, yet they do not interfere with the flame.

The third, or spinning method, is accompanied on a lathe and is used for hardening such units as small gears or pulleys. Here the part spins in front of the flame or group of flames until the path under the flame attains the correct temperature. The flame is then removed and the part quenched in a stream or bath of water.

The progressive-spinning method con-

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Mexican Plumbago is a combination of Mexican Graphite and other ingredients blended and pulverized to produce a powder that when applied to the sand mold—either wet or dry—forms an insulating coating which will prevent the molten metal from penetrating into or fusing with the sand, with the result that the casting peels freely and comes out clean and smooth.

Owing to the fact that various types of molds are necessary to produce different sizes and kinds of castings, we manufacture grades of Mexican Plumbago to meet every requirement; consequently regardless of whether the mold is green sand, dry sand, loam or skin dried, there is a definite grade of Mexican Plumbago especially designed for that practice. The all-important consideration is that the resultant casting is smooth and clean.

Mexican Plumbago will work well under hand, tool or brush—will withstand more heat than ordinary plumbago and will not brush off the mold or run before the iron.

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MEXICAN PLUMBAGO CORDIP BLACKENING
No. 8 MEXICAN GRAPHITE to reduce chill and hardness
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sists of a combination of the progressive and the spinning methods. The work is revolved in a lathe or other suitable device and the flames are moved parallel to the axis of the part being treated. It is particularly suitable for treating long, cylindrical objects which require a hardened surface over a considerable length.

Microstructures found in the flame hardened portions of cast iron parts are the same as those found in regularly quenched irons.

Large dies, such as those used in drawing fenders and body parts of automobiles from sheet steel, are made of alloy irons, and the wearing surfaces are sometimes flame hardened without the use of water sprays. Depending upon the alloy content used, a sufficiently rapid quench is provided by the heavy mass of unheated metal beneath the surface to produce hardnesses of 500-550 brinell.

Since only the surface metal is hardened and since the volume changes taking place at the surface during flame hardening are resisted by the underlying, untreated metal, stresses are set up which result in distortion unless some stress-relieving treatment is given the part. Generally, a drawing treatment at 350 to 400 degrees Fahr. is sufficient to reduce these stresses with only a slight loss in hardness.

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Induction hardening might be described as an electrical induction process of differential heating and quenching to produce surface hardening. This "selective" hardening is accomplished through the concentration of high-power, high-frequency electromagnetic current generating the heat in the surface to be hardened. Heating is fast so that this zone is raised to hardening temperature in a short time interval. The time taken for the complete heating and quenching cycle may be only a few seconds. Close control of the treatment is obtained through automatic control of the power input and frequency of the current, and of the volume, pressure and angle of direction of the water quench.

Peters and Cone[10] described one of the latest applications of this process for hardening the internal surfaces of cast iron cylinder liners. The depth of the hardened zone is about 0.070-inch. The liners range in size from $3\frac{3}{4}$ to $5\frac{3}{4}$ inches inside diameter and 10 to 15 inches long; all are treated in the same machine, which is installed directly in the liner production line. Most of these liners are made from a good grade of low-alloy cast iron, cupola iron being entirely satisfactory. A typical specification of the iron for this purpose runs 2.80 to 3.10 per cent total carbon, 0.60-0.80 per cent combined carbon, 0.50-1.00 per cent nickel, 0.25-0.50 per cent chromium, and should have a tensile strength of over 45,000 pounds per square inch.

Hardness Decreases Rapidly

Records are available of an induction hardened cylinder which had been processed through a production shop and whose composition and hardness were determined as shown in Table VIII.

As indicated by Table VIII, the hardness decreases rapidly below the case depth of about 0.07-inch because the diamond penetrator is perforating the case and passing into the softer underbody.

Induction hardening achieves importance where large volumes of production castings must be treated to compensate for the development of suitable jigs, fixtures and other control devices.

In conclusion, the author wishes to acknowledge the use of unpublished material prepared for the heat treatment chapters in the American Foundrymen's Associated Handbooks on "Cast Metals" and "Alloy Cast Irons". Contributions by S. C. Massari, metallurgist, Association of Manufacturers of Chilled Car Wheels, and George Timmins, Climax Molybdenum Co., on flame hardening, were particularly helpful.

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Chevrolet Casts Magnesium

(*Concluded from page* 94)

that the gray iron and magnesium operations have been separated entirely, with the erection of a partition dividing the plant. Women burring operators are protected from the magnesium dust by working in booths from which the dust is airborne into water and then quickly flooded.

Side by side with its considerable magnesium output, the Chevrolet foundry is continuing its gray iron operation, averaging about 300 tons output daily, about the amount originally expected. Peacetime production averaged 2100 tons daily.

Still meriting the title "world's largest foundry"—on an output basis—this Chevrolet unit processes two metals "where one grew before." The foundry's entire magnesium production is devoted to a Chevrolet aircraft engine program for which, it recently was announced, contracts with the Air Forces have been increased five-fold.

Book Review

World Minerals and World Peace, by C. K. Leith, J. W. Furness and Cleona Lewis; published by the Brookings Institution, Washington; 253 pages, price $2.50.

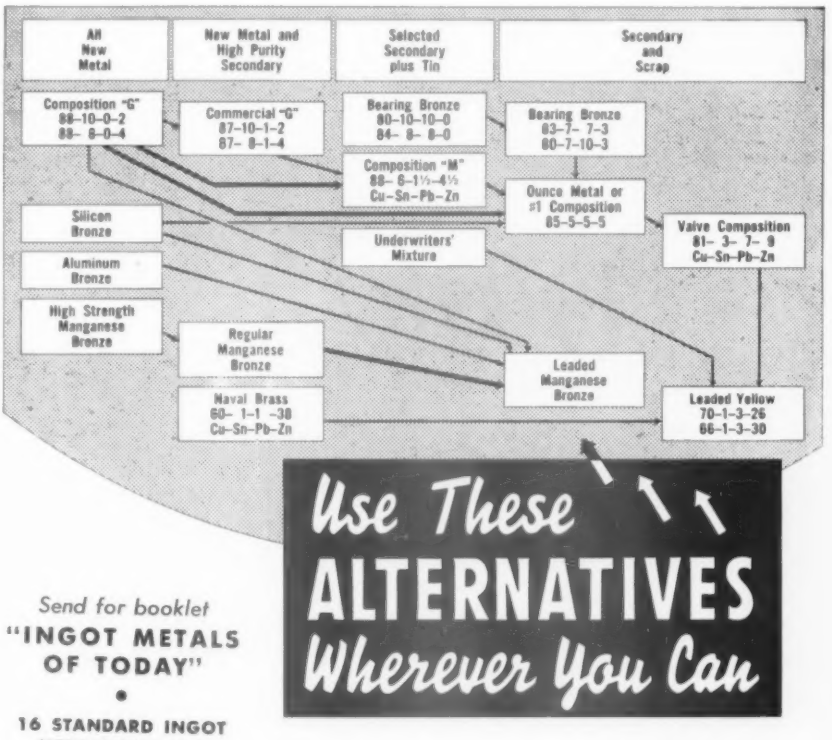
Purpose of this book is to present a factual study of trends in the mineral field—physical, economic, and political—and in the light of these trends to analyze the possibilities of controlling minerals to prevent preparation for war. It reviews the unequal distribution of mineral supplies among various nations and shows that this inequality may not be materially changed by discovery, technology or legal enactment, and that therefore the interdependence of nations is inescapable and likely to be intensified. Principal elements of strength and weakness in various monopolies and cartels organized in the minerals industries are described.

The authors point out that the mineral problem reached an explosive stage with the advent of World War I and again in World War II, and that probably other explosions will come in the future, unless the world is more successful than in the past in steps taken to solve the problem. The final chapter discusses the nature of the mineral control problem as a factor in world peace and the general requirements for effective control. Numerous tables, charts and maps on production and trade in leading minerals by various countries are incorporated in the book.

To Discuss Electric Steel Production

Electric Furnace Steel Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers will hold its first annual conference on Oct. 1 and 2 at Hotel William Penn, Pittsburgh. The 2-day intensive meeting is being arranged under the general chairmanship of C. W. Briggs, Steel Founders' Society of America, Cleveland, and will cover all phases of acid and basic electric furnace practice.

First day Oct. 1, will be devoted to a joint session on basic and acid practice relating to the development and present status of the industry, electric furnace design, refractories, electrodes and raw materials. A talk by a leader of the industry will feature the evening session. Meeting on the second day, Oct. 2, will be broken up into sessions on basic and acid practices with discussions on many important developments in melting, oxidizing, deoxidizing and refining schedules.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New Metal and High Purity Secondary
Selected Secondary plus Tin
Secondary and Scrap
Composition "G" 88-10-0-2 88- 8-0-4
Commercial "G" 87-10-1-2 87- 8-1-4
Bearing Bronze 80-10-10-0 84- 8- 8-0
Bearing Bronze 83-7- 7-3 80-7-10-3
Composition "M" 88- 6-1½-4½ Cu-Sn-Pb-Zn
Ounce Metal or #1 Composition 85-5-5-5
Valve Composition 81- 3- 7- 9 Cu-Sn-Pb-Zn
Silicon Bronze
Aluminum Bronze
Underwriters' Mixture
High Strength Manganese Bronze
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Naval Brass 60- 1-1 -38 Cu-Sn-Pb-Zn
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Ajax-Hamilton Gear Bronze
Ajax Nickel-Copper 50-50%
Ajax Manganese Copper
Ajax Aluminum Alloys
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Nickel Alloys
Ajax Phosphor Tin

NOTE

"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

Notice how the arrows on the W.P.B. chart point to the *right*. . . . They show how alternative materials *currently available* can be utilized by foundrymen as now permitted by many designers. The purpose is to conserve primary metal at the mine through increased use of secondary ingots. Sometimes great ingenuity is called for, yet remember this:

The first program for scientific control of ingot metal was set up by Ajax 45 years ago. The result has been metal and practical technical follow-through in which Ajax increases your production by reducing rejects.

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AJAX ENGINEERING CORP. Ajax-Tama-Wyatt Aluminum Melting Induction Furnaces

FORD CASTS CYLINDER BARRELS

(*Concluded from page 99*)

for pouring the metal into the molds. The iron is allowed to solidify as the turntable swings through approximately one-third of a revolution. Since the cycle is about 3½ minutes for each revolution, about a minute is allowed for each casting to solidify.

The cylindrical molds rest on steel wheels in the casting machines, and these rollers are driven by a motor located in the base of each. An air hoist lifts the molds in and out of the machines, where they are covered by a hood as they spin at a speed of 750 revolutions a minute.

While the metal is still hot and the cast cylinder still glowing inside the mold, it is lifted onto a conveyor and taken to another station where the casting is knocked out. Each cylinder is weighed here to see that there is sufficient metal for proper finishing. Next it is stamped with the heat number; the casting then goes to a normalizing and annealing furnace. After shot blasting to remove scale, the casting is ready for machining.

The saving in alloy steel is appreciable in the casting method—"17,500 pounds a day when running 500 cylinders," a Ford engineer states. "On this production basis forging equipment costs $134,000 while foundry equipment for 500 a day costs only $34,700. The latter type of equipment is available in probably 30 or more foundries."

Although the steel analysis is the same for both cast and forged cylinders, the engineer said, the difference lies in grain structure.

Getting approval for substituting the cast steel barrels was the toughest problem for Ford. Company engineers knew what they could do with steel but no one else had any experience with these cylinders in service. Pratt & Whitney did not have time to experiment with the new barrels and Pratt & Whitney approval was necessary before the cast barrels could be used on the Ford-built engines.

The first barrels, for Rolls-Royce engines, cast in July, 1940, were tested at the Massachusetts Institute of Technology, and engine tests were recommended after the barrels were declared to be satisfactory.

Barrels Pass Tests

After tests on a single cylinder engine, the barrels passed ground tests on a multi-cylinder engine. Army Air Forces engineers at Wright Field then became so interested that they asked that an engine be built with cast steel cylinders and be sent to them for further tests. As a result of these tests, authorization was granted on Nov. 13, 1941, to use this type barrel on all Pratt & Whitney engines which Ford was building.

Bursting strength of the forged nitralloy steel barrel was found to be 5200 pounds, and that of the cast S.A.E. 4140 steel barrel 9200 pounds.

The process of casting metal centrifugally was conceived about 1809, but was not applied commercially until the twentieth century. It was not used widely until in comparatively recent years when Ford was among the first to apply it to production of automobile parts. In May, 1937, Ford began casting transmission cluster gears and ring gears by this method.

In addition to aircraft engine barrels, Ford now is centrifugally casting cylinder barrels and flywheels for the Ford tank engine, spindles for the four-wheel drive armored car and truck, tank sprockets, tractor transmission gears and several landing gear parts for the Ford-built B-24 bomber.

Meehanite Metal Corp., New Rochelle, N. Y., announces that John Hastie & Co. Ltd., Greenock, England, are now manufacturing meehanite castings. The majority of their production will be used in shipbuilding construction, chiefly hydraulic steering gears. There are now 22 foundries in Great Britain producing meehanite castings.

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FLASK RAPPER

★ Made in sizes that will shakeout flasks 2′ square up to 20′ x 24′ x 4′ deep.

★ Jaw construction will take wide variation of flask flanges without change.

THE "BRANFORD" FLASK RAPPER ENTIRELY ELIMINATES FLASK BREAKAGE AND REDUCES SHAKEOUT TIME TO A MINIMUM.

Below is what an 8″ Flask Rapper is doing for one of the many users of "Branford" Shakeout Equipment.

WORK	NO. MEN		TIME PER MAN
Cope 9′ x 15′ 4″ x 14″	Shakeout by Hand	9	25 min.
	With Branford Vib.	2	20 min.
Cope 10′ x 7′ 6″ x 3′ 8″	Shakeout by Hand	7	105 min.
	With Branford Vib.	2	18 min.

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METALLURGY IN THE CASTINGS INDUSTRY

(*Continued from page* 101)

tors. Significantly a considerable proportion of this work has been sponsored by the U. S. Navy Department. In matters of usage of alloys and in control through heat treatment, the steel casting industry owes much to the wrought steel industry, particularly in the earlier stages of these developments.

A fundamental development (or perhaps more accurately a method of clarification of the relationships of composition, time and temperature to end product) of recent years is the S curve of Davenport and Bain[10], who are primarily wrought steel workers. They state ". . . this study proposes the addition of the time factor to the iron-carbon diagram." The general idea of time as a factor is not new, but the quantitative evaluation of time for given reactions or degree of reaction is of greatest significance to the metallurgist. Effects of alloys and of various thermal treatments become more clear. The approach is not confined to the austenite to ferrite-carbide reaction, for it can be and has been applied to other reactions. It is not evident whether the cast steel group has as yet made much direct use of this fundamental development. Certainly more economical usage of alloys (as in the N.E. steels), and studies of possibilities in treatment (as by the methods of the S curve and end quench hardness tests) constitute an attractive field for the cast steel worker.

Normalizing Widely Used

Earlier heat treatments employed annealing to relieve internal stresses, improve machinability, get good ductility, and like properties. Today normalizing (air quenching) and drawing are widely used to enhance physical properties, and to attain maximum benefit from alloy additions. Liquid quenches are coming into greater use even on castings weighing up to 10 tons. It seems logical to expect considerable extension of the method so that maximum mechanical properties can be attained wherever needed. Extension of practice of delayed quench is a probable development.

It is interesting to note that emergency development of the N.E steels has done much to offset inertia on the one hand, and "overselling" on the other in wrought steels. This has resulted both in greater economy and in better understanding of the role of alloys. The use of copper as an "age hardening" addition is of interest to makers of steels, malleable, and gray irons.

Researches into the physical chemistry of steel making have been profitable. Present and future findings may minimize some of the differences attributed to various melting processes. The recent work of Sims and Dahle (*Proceedings*, A.S.T.M.—1942) lends credence to that belief. Study of deoxidation processes has resulted in a number of changes; for example, boil, recarburization and deoxidation are common practice in the acid electric furnace, whereas some years ago rather complete boil and recarburization were considered unorthodox. Considerable further development along the lines of deoxidation, scavengers, grain size control, hardenability et cetera of cast steels, as influenced by the processes and treatment in melting, is expected. Papers like that of Sims and Dahle[11] and of Gagnebin[12] together with their bibliographies and the discussions, and the reviews in the 1939 *Transactions* possess not alone immediate practical value, but are stimuli toward further work.

Sand control, study of internal stresses, mass effects, and other factors are receiving the attention of the industry. Developments of molding media other than sand, and of methods, such as centrifugal casting, are significant. Lighter weight castings of more intricate design and better surface finish are more common.

The writer's particular interest in cast steel manufacture is the production of pressure castings for elevated temperature usage. Beside pressure tightness the

COREMAKER:
"SINCE I'M UNDER OATH....

I'LL SAY THIS ABOUT MOGUL BINDER..

it makes good cores that dry out and *shake out*. You don't get green centers."

THE COURT: **Q.** "Tell the court what a green center is.'

COREMAKER: ***A.*** "The center of the core isn't dried out. *Mogul* gives high green bond value in sharp sand. *Mogul* holds it together. When the core is baking, the sand is open enough to let the gases out. And the core dries all the way through."

THE COURT: **Q.** "Don't the cores stick?"

COREMAKER. ***A.*** "No, Sir, Judge! You can shake cores out easy if you use *Mogul* and sharp sand."

THE COURT: **Q.** "How about using oil with *Mogul?*"

COREMAKER: ***A.*** "Sure. *Mogul* has a high hot strength, so no matter if the cores get hot *Mogul* keeps 'em stiff. And let me tell you, judge, you can use *Mogul* as a binder in dry sand and green sand for molds. Castings come out clean because *Mogul* burns out and peels like an onion.''

CORN PRODUCTS SALES CO.
17 BATTERY PLACE · NEW YORK CITY

usage necessitates control of properties perhaps not so necessary in other applications. Some work by H. E. Montgomery and J. Urban of the Lunkenheimer Co. research staff illustrates approaches to achieve understanding of the relationship of elevated temperature properties to structure.

Elevated temperatures and high pressures are a severe combination, and the satisfactory service given by cast steel valves is evidence of their reliability. At temperatures of 950 degrees Fahr. the metal is a dull red, quite distinct in the dark. In some plants up to about 2500-pound steam pressure is carried at temperatures 900 to 925 degrees Fahr. (In oil refineries considerably higher temperatures are not uncommon, but length of expected service life is not as great.)

Load carrying capacity drops off at elevated temperatures, as may be seen from the short time test chart, Fig. 7. Such short time or regular tensile test at elevated temperatures is misleading because when load is sustained for a long time, the phenomenon of "creep" or "flow" occurs. Beside the immediate and rapid extension occurring when load is applied, the material may continue to stretch, although at a very slow rate, for many thousands of hours. It is essential that this rate be known and controlled so that the article or mechanism will not distort sufficiently to become inoperative or even to rupture. Rates of extension under 1 per cent per 100,000 hours are required. Suitable steel structure and suitable design stresses must be combined to achieve this result. A rate of 1 per cent per 100,000 hours is a rate of 0.000,000,1-inch per inch per hour, or one tenth of a millionth of an inch per inch per hour.

It has been known to metallurgists that "grain size" has an effect; this probability was suggested by Spring and Kanter[13]. More lately attention has been given[14] to the condition of the carbon in wrought steels.

The work of Montgomery and Urban evaluating *both* these factors in a cast steel, is of interest in that it shows the tremendous differences that can be attained in load carrying characteristics (creep) of steel from the same heat and with not greatly different room temperature acceptance test results.

The steel used was A.S.T.M.—A-217-WC1, welding grade of carbon-molybdenum of the analysis of Table 1.

Table 1

	Per Cent
Carbon	0.26
Silicon	0.40
Manganese	0.64
Phosphorus	0.025
Sulphur	0.032
Molybdenum	0.50
Nickel	0.08
Chromium	0.01
Copper	0.08
Aluminum (total)	0.085
Aluminum (oxide)	0.026

Acid electric process, ore boil, and final aluminum addition of 2.4 pounds per ton melt was used. A conventional treatment produces tensile test properties well above the minimum requirements of the specification, together with certain other desired properties.

For purposes of their research Montgomery and Urban used various methods, including delayed quenches, and produced the structures shown in photomicrographs of Figs. 2, 3, 4 and 5. These exhibit:

2*A* and *B*—Coarse grained acicular, average grain size 4-5; 3*A* and *B*—Coarse grained pearlite-ferrite, average grain size 5; 4*A* and *B*—Fine grained acicular, average grain size 10; 5*A* and *B*—Fine grained pearlite-ferrite, average grain size 8.

By acicular is meant a transition product intermediate between pearlite-ferrite and martensite. By grain size is meant size of ferrite grains, pearlitic patches, and acicular areas, the last as outlined by change in direction of the carbide plates, using the A.S.T.M. Tentative Classification of Austenitic Grain Size in Steels as the unit of measurement.

Creep (time-extension) curves are shown on chart, Fig. 6, all at loadings of 12,000 pounds per square inch and at 950 degrees Fahr.

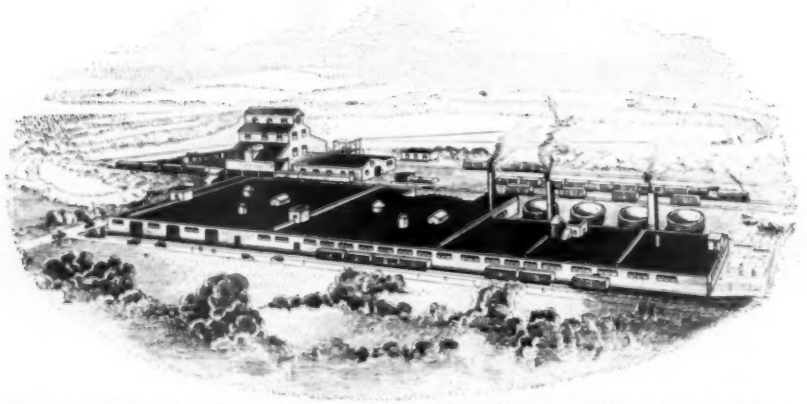
The relative order of merit of structures is:

Structure	**Creep Rate*
Coarse acicular	1
Fine acicular	3.5
Coarse pearlite	7.5
Fine pearlite	48

*500 to 20,000 hour period in per cent per 100,000 hours.

GOOSE LAKE

Fire Clay and
Fire Clay Flour
Fire Clay Brick
Therm-O-Flake Insulation



Goose Lake Clay Deposit with Clay Grinding and Fire Brick Plant

Illinois Clay Products Company

JOLIET, ILL.

This difference of 48 to 1 at a given load is tremendous. It shows how great may be the possibilities of fitting steels to their usage.

The preceding is an ultra condensation of the painstaking and accurate experimentation by Montgomery and Urban. It indicates clearly that the factors of "grain size" and "carbide form" are interdependent. It also is an excellent illustration to foundrymen of the possibilities inherent in studies of time and rates of reaction; both on structure control and the resultant mechanical properties.

A few years ago many foundrymen were more than afraid of the competition of and from fabrication welding. In some quarters a negative and nonconstructive attitude was taken. Sampson[15] met the issue squarely. C. W. Briggs urged foundrymen to utilize the art of welding, stating that "there is an almost unlimited field for the application of steel castings as integral parts of composite welded structures." Recognizing that some engineers regarded aluminum deoxidized cast steels as of dubious weldability, A. J. Smith and the writer presented[16] the results of some detailed researches before the association. Aluminum deoxidized steels compare most favorably with wrought steels of similar general composition.

Castings in Welded Assemblies

The welding of cast to wrought and to cast steels has been successful in the central station field, and the number of flange and bolted joints has diminished greatly. It is hoped that the steel branch of the castings industry will pursue aggressively the matter of educating designers to be fully cognizant of the possibilities of cast steel in welded assemblies.

For the future we expect to see more selection of processes, primarily on basis of cost. Developments which enable substantially the same mechanical qualities to be attained, irrespective of process, appear to be on the way. More detailed understanding of depth of hardening characteristics and the factors which influence it is needed. There is a need for studies which show more definitely just how stresses are distributed. These would enable metal to be placed where it is needed as well as where it is merely wanted. The classic mechanics have their limits and involve many assumptions and deductions.

Induction melting, now applied principally to highly special alloys, may be extended along new lines, as the converter processes in turn may gain in others. Unit structural assemblies incorporating castings undoubtedly will become even more common, especially if co-operation with designers is extended.

Methods of localized hardening and deposited overlays of special metals have a good start. Sand as a molding medium has been augmented by other media. Indeed metallurgical thought has gone beyond steel as an iron and carbon alloy and contemplates alloys of iron with other elements playing the role of carbon.

The combined ingenuity of the designer, the science and art of founder and metallurgist, and the skill and judgment of industrial management, are far from their possible attainment, not alone in steel castings, but in the whole casting industry.

MALLEABLE IRON

One summer about 30 years ago, the writer was busily engaged in a malleable shop chipping room when not occupied in shaking out hot castings. Perhaps memories of the 60-hour week at 10 cents an hour did not encourage a return to this field. Ensuing comments perforce must be those of an observer.

American blackheart malleable was invented by Seth Boyden in 1826. The art is a new one in comparison to gray iron and bronze casting, an old one in comparison to the casting of light alloys. Malleable iron was developed to combine fluidity, a characteristic of cast iron, and ductility, a characteristic of steel.

Founders were forced to develop technical control to attain uniformity. When bad, since it was first a product of the empirical art, malleable iron often was completely unusable — brittle and unmachineable.

Touceda was among those who promoted manufacture and sale according

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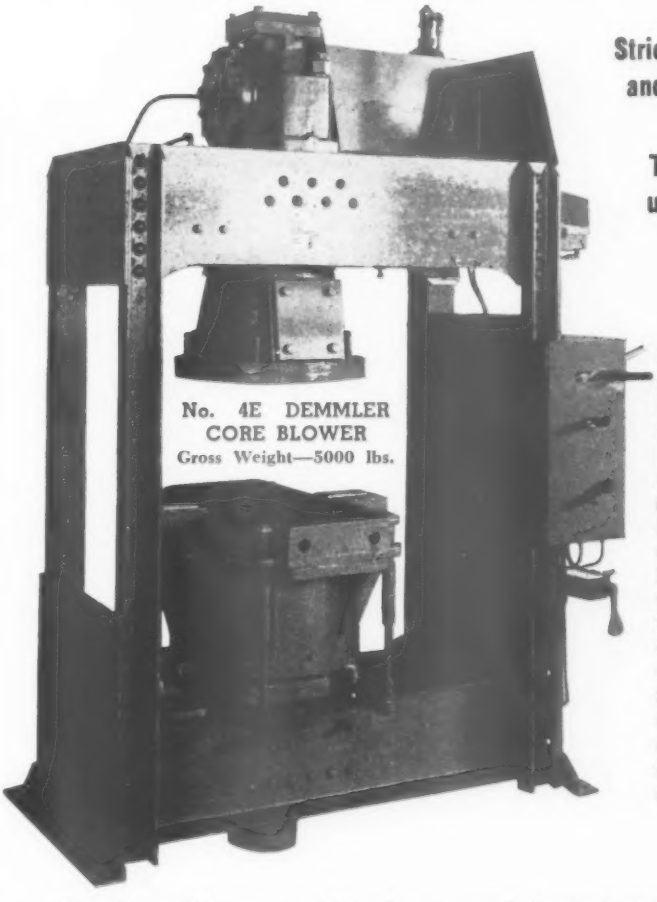

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Reports on this new machine from users indicate that it has unusual possibilities in production of aircraft, tank and truck motor castings. At the present time we can make good deliveries, and invite your inquiries.

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to definite physical specifications. Guarantees of minimum tensility and ductility are reassuring to the engineer and designer. Much also was done to standardize manufacturing procedures. For years, one trade group has promoted its product as "Certified Malleable." The industry as a whole follows specifications such as those of the A.S.T.M.

There are dangers in rigid standards. It is possible that desire to maintain the *status quo* at first deterred most rapid development and acceptance of variants from the original ferrite-graphite metal. There are many possible variants.

It is not easy to promote customer acceptance effectively until there is definite classification. At first this preferably might include a relatively few clear-cut classes. Many consumers (like some manufacturers) are hesitant about adopting any but simple and clear-cut innovations. Pearlitic malleables compete not so much with ferritic malleables (hence within the industry) as with other materials of construction.

It is evident that the association is well aware of the developments in classes of malleable iron. In fact the A.F.A. Exchange paper by Carl Joseph before the 1942 meeting of the Institute of British Foundrymen dealt wholly with one of the new modifications.

Annealing practices for malleable iron, worked out over many years, are reliable but time consuming. There seemed initially some inertia toward development of "quick anneals." Newer types of equipment and more precise knowledge of graphitization rate possibilities combine to make "quick anneals" attainable. At present choice seems to rest on economic grounds. With satisfactory product attainable by either the "long" or "quick" methods, relative cost of equipment, its operation and its control, must be balanced against value of elapsed time.

Older specifications assigned cupola malleable to a low estate. The late L. W. Spring was among those who showed that cupola malleable possesses easier machining and better casting characteristics, together with its obviously lower melting cost. Developments and improvements in cupola melting and control are reflected in possibilities of somewhat improved metal. Greater latitude in applications is being sought.

Graphitization Is Major Problem

As with gray iron, graphitization is a major problem in the foundry metallurgy of malleable iron. There are several distinctions. In malleable the graphite is formed from the white iron structure, not during the cooling from the melt. A much narrower range of composition is adhered to, also a more limited range of casting sizes. By comparison the structural metallurgy of gray iron is the more intricate. On the other hand the malleable industry has gone more intensively into the study of effects of time and temperature. Among those who have presented the fruits of their studies on graphitization before this association are Schwartz, Bean, Davenport, Touceda, White, Archer, Hayes, Smith, Lorig, Forbes, Schneidewind, Boegehold, Joseph and Ziegler. The 1942 symposium held under the joint sponsorship of the A.F.A. and A.S.T.M. is an excellent summary, not alone of today's status relative to the theory and mechanics of graphitization (as referred to previously) but also of the means and procedures used to attain the desired ends.

Despite the work already done and the considerable clarification achieved, a number of problems remain. Time or reaction rate and possibilities of marked modification thereof not only attract the theorist but are of potential economic significance. Temperature and compositions are controlling media. Acquiring more precise knowledge may result in new avenues of approach toward economy, together with more complex compositions and methods of treatment appreciably different than those employed today. This industry seems fully cognizant of the usefulness of foundry metallurgy. Therefore, there is expectation rather than mere hope of progress. Expansion of usage of malleable iron product in today's war effort intensifies this belief.

NONFERROUS

It is probable that this war period will initiate a renaissance in the cast nonferrous field. This branch is readjusting

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itself rapidly to the new conditions and is playing an effective part in helping in prosecution of the war. "Necessity is the mother of invention," and acute shortages in some strategic materials represent necessity. Iconoclasm supplants tradition. Thus the story of metallurgical development can be told better after the victory is accomplished.

This branch of the foundry industry has been represented within the last 20 years by several distinguished A.F.A. presidents, namely Dr. G. H. Clamer, N. K. B. Patch and James L. Wick, Jr. Looking back over the *Transactions* during the period 1920-1929 one finds the names of a number of able workers who still are active, including Binney, Ellis, Roast, Romanoff, St. John, Wolf and others. Since that time the publications of a number of other aggressive workers have been added to the *Transactions*.

Although the number of nonferrous foundries nearly equaled that of the iron foundries, (*Penton's Foundry List*, 1940), casting production was about one-seventh that of the gray iron foundries. There are comparatively few large units, and production of the average foundry is low.

The *Transactions* are not a particularly comprehensive repository of fundamental development data in this field. In fact there is comparatively, not a great deal of data published in any medium.

Progress Has Been Slow

There are in the *Transactions* a number of references to new methods of melting (high frequency induction, indirect arc, cupola, and so on) and to various "practical" aspects of foundry practice and testing. There have been, in the last 20 years, only a scant half dozen original papers dealing with the structure and chemistry of the alloys. *The Recommended Practices* and *Cast Metals Handbook* contain useful data and suggestions. They are not designed nor intended to deal with fundamental structural metallurgy.

It seems probable that the work of the nonferrous division will be expanded in the future. Review indicates that in the past, two factors have had an inhibiting action upon its activities. These are (1) the great, and, until recently, unclassified variety of alloys and (2) the organizational setups in the nonferrous field.

Five bases (copper, nickel, zinc, lead and tin) are listed by the nonferrous division. The A.F.A. *Cast Metals Handbook* (following A.S.T.M.-B-119) gives 23 generic classes of copper base alloys alone. Each class usually has several specific alloys thereunder. Each alloy may have several variations. (85-5-5-5 was said to have had 40 recognized variations.)

An appreciable degree of simplification was initiated through the efforts of Clamer and others. The Specifications Branch of the WPB Conservation Division has been prosecuting simplification recently. Yet wide diversity remains. Many alloys differ, both in composition and in metallographic structure as, for example, copper-tin, copper-zinc, copper-silicon, copper-aluminum, and many varieties and modifications thereof. A result of this diversity is a comparative dearth of intensive studies and the existence of relatively few research papers. A review of actual development of each class of alloy, and an organized summary of scientific and technologic advance would be difficult; a balanced one almost impossible. Many of the alloys are based on empirical formulae handed down for many generations. There remains much to be learned about a number of alloys, the standard as well as the proprietary.

Many of the copper base alloys have been handed down for generations. However, there are some relatively recent ones—certain new silicon hardened alloys being among them. The A.S.T.M. *Bulletin* Dec. 1942 pages 31-35 contains a bibliography covering the literature and patent citations on silicon bronzes over the period 1926-1941, sponsored by Committee B-5. This was prepared by A. Wuest. Some other silicon hardened alloys date back many years. The practical and controlled hardening of nickel with silicon, aluminum, beryllium, etc. has come about largely within the last 20 years. (This was one of the outgrowths of the theory of precipitation hardening.) There have been a number of

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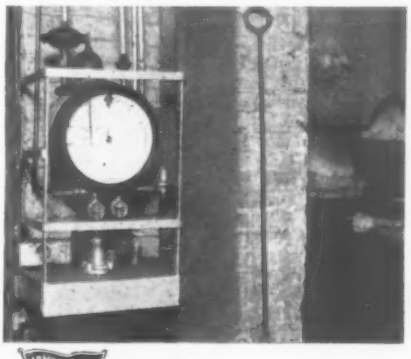

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other developments, such as those in the lead base alloys, within recent years*.

The American Brass Founders' Association was established in 1907. This dealt with both the "practical" and the "theoretical" fields. Meetings were held at the time and place of the American Foundrymen's Association meetings. The name was changed to the American Institute of Metals in 1912. At that time increased emphasis was laid on "theoretical" papers, and it was difficult to get "practical" papers.

In 1918 the American Institute of Metals became affiliated with the American Institute of Mining and Metallurgical Engineers as its Institute of Metals Division. Until 1927 the Institute of Metals Division continued to hold one meeting in conjunction with the A.F.A. convention.

Since that time (1927) the Institute's meetings have been held elsewhere. For a number of years its fall meeting has been held in conjunction with the American Society for Metals. Out of 60 some papers on the institute's 1941-1942 programs about four are of interest to foundrymen. The wrought metal interests predominate. This might be interpreted as evidence of apathy on the part of the castings interests.

The A.F.A. put its divisional plan into effect in 1929. As first chairman thereof we recall discussions relative to the part that the A.F.A. nonferrous division should play.

It is thought that it might be well now to consider the examples of other A.F.A. divisions. These have not been hesitant about placing fundamental developments and "theory" before their members. Such papers have been well received. The interests of the "practical" man and the "theoretical" man ultimately are the same, and each has much to gain from the other. There is room for more papers on cast nonferrous alloys before the Institute of Metals.

Some excellent work is being sponsored by the American Society for Testing Materials and by some trade bodies, notably the Non-Ferrous Ingot Metals Institute. Extension of the co-operation already existing between these groups, the Institute of Metals and the A.F.A. would be helpful. The question of test bars is one among several problems that need intensive study. The old Institute of Metals was working[17] on the test bar problem back in 1916. Lately Committee B-5 of A.S.T.M. assembled some interesting data which indicate the inadequacy of some conventional bars. The 1942 A.F.A. nonferrous round table includes discussions on this problem. The following is a quotation from a resolution passed at that meeting—"Resolved, that the sense of the meeting is that test bars other than those prescribed in Federal Specifications and A.S.T.M. Specifications should be permitted and recognized when supporting data are available and given which shows that such bars produce sound castings suitable for specification and certification."

More Knowledge Needed

Another possibility is closer connection with the A.S.T.M.-A.S.M.E. Joint Research Committee on the Effects of Temperature on the Properties of Metals. Promotion of widest safe elevated temperature application of nonferrous alloys demands more detailed knowledge than now exists.

Some problems of porosity and of age hardening are considered in the balance of this section. These generic subjects, although here applied only to copper and nickel base alloys, as of interest to the nonferrous division, also should suggest some approaches interesting to all foundrymen and workers in metals.

Understanding of the causes and of methods useful to combat unsoundness is a problem worthy of united consideration by all branches of the metals industry, cast and wrought. In wrought products seams, cracks, preferred orientations, and similar defects are not uncommon. In

*Perhaps it is well to mention that your lecturer's experience in this field is limited in several respects. Some 5 years with "Daddy" Ling (teacher of Charles Vickers) on machine tool and paper mill castings (bearings, gears, blades, screws, and some other parts of 88-10-2, 80-10-10, manganese bronze and aluminum bronze) were followed by 16 years on tin and silicon bronzes, nickel alloys, fusible metals, and the like—some 30 alloys possibly—all pressure work for severe engineering services. Therefore, he lacks practical experience on art castings, zinc and other die castings, yellow brass, "German" silver, alloys, etc.

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castings attention is given to the matter of porosity or lack of density, although other manifestations, such as cracks, sometimes are met.

Porosity not alone unfits a part from holding fluid pressures, but also indicates a mechanically weakened structure.

Modified tin bronzes, widely used for pressure castings, are of unusual interest when study of porosity is contemplated. These alloys seem to be susceptible to nearly every sort of "evil influence" to which metals are heir—including high sensitivity toward gasing, a long freezing range, marked segregation, and other similar tendencies.

Correct diagnosis is essential to a logical cure. Unfortunately, porosity was originally diagnosed as "oxidation." This pronouncement was made by eminent British metallurgists and by the U. S. Bureau of Standards. As a result when Woyski and Boeck[18] observed that porosity might be caused by reducing atmospheres and foundry shrinkage, little attention was given to these pioneers. The idea was not absolutely new. It is known that about 1910 Clamer had used oxide addition in the ladle whenever the gates rose on the first flask poured. (This was not published). Although Woyski and Boeck lacked indisputable analytical proof, their observations and deductions were correct. The castings industry should have been open-minded and interested enough to promote further research to confirm or deny the findings of Woyski and Boeck.

Diagnose Porosity

In 1929 the general mechanisms which cause intercrystalline porosity were diagnosed and various causes enumerated[19] This work, backed up by analytical data and much shop and laboratory research, confirmed and considerably extended the observations of Woyski and Boeck.

It was shown that porosity resulting from intergranular fissures is essentially a shrinkage phenomenon. The term "incipient shrinkage" was chosen to describe it.

Armed with a correct diagnosis (based on study of the relationship between jagged shrinkage fissures and the tiny intergranular fissures often appended thereto) it was not particularly hard to understand and to demonstrate the general roles played by gating, by pouring temperatures, by design, and by furnace atmospheres. The action of minute amounts of gases rejected during solidification could be understood. The old "oxidation" theory was exploded. It was found that basic causes lay in design, gating and (in furnace practice) the presence of "reducing" not "oxidizing" gases. The use of gas analyses to actually measure and *control* atmospheres was used and advocated.

The "incipient shrinkage" diagnosis has been confirmed by 25 or more research papers since that time. These add considerably to our knowledge of the various and intricate mechanisms involved. Some points remain to be elucidated fully.

The recent paper[20] of Pearson and Baker is recommended for study. Those authors covered the action of various gases within very small ranges of composition, temperature and time, and established the co-existence of hydrogen and oxygen —within certain limits—and subsequent reaction with evolution of steam. Extension of their technique to cover many more alloys would be helpful. Pearson and Baker's paper was reviewed in H. L. Smith, *Transactions*, American Foundrymen's Association, vol. 50 (1942), pp. 490-497.

Among a number of worth-while publications those of Ellis[21] and Doughty[22] are for purposes of study usefully complementary to papers for the Pearson and Baker type. Doughty showed that alloys of 10 per cent lead and above, when oxidized, may be reactive to carbonaceous matter in cores.

The staff of the Lunkenheimer Co. laboratory has given porosity phenomena considerable attention, from both laboratory and plant research viewpoints. Knowledge acquired has been useful in helping maintain low losses and in avoiding "epidemics."

A certain degree of oxidation usually is required to prevent undesirable reactions with atmospheres containing hydrocarbons, hydrogen, water vapor, carbon monoxide, and similar gases. Such reactions or "poisoning with gases" are

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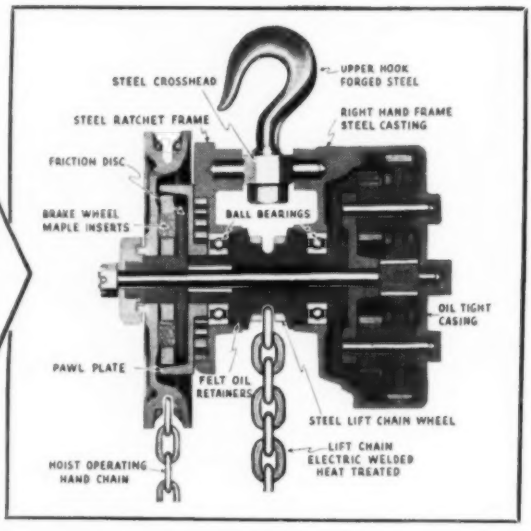

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cumulative. This was noted particularly in the case of carbon monoxide. The reaction mechanisms with carbon monoxide (taking into account the work of others on solubility) may be indirect. Its intensity varies greatly according to the alloy involved.

"Oxidation" may be accomplished by atmosphere control (by analysis). "Neutral" (CO and O_2 free) products of combustion, plus handling in air (as in pouring), effect some oxidation. This can be increased by keeping a trifle on the O_2 side. Some oxide in the charge, or added to the bath, often is desirable with the higher copper alloys. The effectiveness of solid oxide incorporation appears to vary according to the method used.

Reactive To Organic Material

As shown by Montgomery and Wuest some alloys containing only 5 per cent lead, melted under above cited conditions, are quite reactive to organic material, as in molding sand or elsewhere. In some cases phosphorus is not very effective as a deoxidizer in red brasses. Weigand and Wuest have demonstrated that the effectiveness of some deoxidizers is not necessarily proportional to their heats of oxide formation. The writer has shown that in some types of alloys a very decided excess of deoxidant is necessary to effect low oxygen content. (As shown by vacuum fusion analyses.) It cannot be assumed that because a trace or small amount of residual deoxidant is found by analysis, it necessarily follows that the metal is "oxide free." The law of mass action comes into play, just as has been shown by accurate test to be the case in the physical chemistry of steel making. In all probability effectiveness depends not alone on the differences in heats of formation of oxides, but also on the possibility of partition. In other words, some balance of energies in the system is involved, and heat of oxide formation is but one. Smith and the writer have shown that a minor percentage of a special addition is in some cases effective in preventing segregation and "sweat." These particular cases evidently were due to film formation effect.

Without doubt work of this type is conducted in a number of other laboratories. Little of it is published in the *Transactions.* In a commercial laboratory there are limitations to the amount of fundamental research conducted. Emphasis must be placed upon practical application. One goes into fundamentals only insofar as these are necessary to clarify his own particular problems. A discreet research worker soon realizes that caution must be used in drawing broad conclusions from observations on a few alloys. There are great gaps in knowledge. Yet the fundamental problems of composition, temperature, and time are not beyond the industry and the nonferrous division. Realization that there are broad problems is desirable.

In 1919 Merica, Waltenberg and Scott presented a theory of the mechanism of age hardening[22]. This was and is an out-

standing contribution to the science of metals, and to practical development in the nonferrous alloys (and light alloys) field, and in other fields also.

Among alloys there are many instances where one component possesses but limited solid solubility. If this solubility is exceeded, the excess component (called the solute) strives to precipitate from the solution. The degree of solubility usually decreases with decrease in temperature, increases with increase in temperature. Thus in a system of limited solubility, the percentage of dissolved solute is greater at high temperature. Precipitation takes place when, on lowering temperature, the solubility limit at lower temperatures is exceeded. However, if cooling is rapid, there is not enough time for precipitation to take place, and a supersaturated solid solution is obtained. (Such rapid cooling is called a "solution quench.") If then this supersaturated solid solution be "aged" (which in practice usually means reheating to some moderately elevated temperature, although some alloys age at room temperature) the excess solute (precipitate) is able to free itself from solution. Such precipitation often has a hardening effect, hence the term "age hardening."

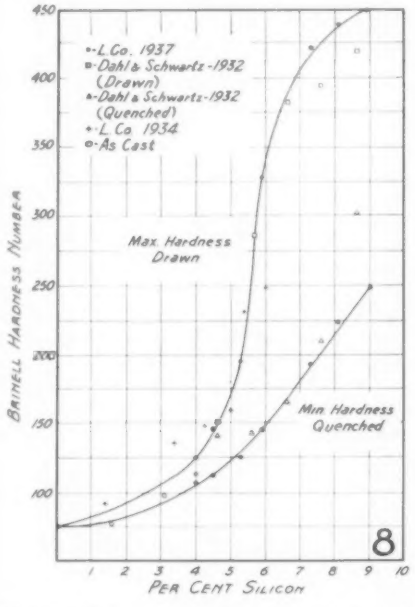

Fig. 8—Effect of silicon on hardness of nickel

The mechanism originally postulated by Merica and coworkers contemplated precipitation in some form beyond atomic dispersion, for example, molecular, colloidal or crystalline. Certain modifications of the original theory have been made. It is suggested that the lecture of Merica (*Transactions*, A.I.M.E.-Inst. of Metals Div. 1932) and the symposium of the A.S.M. (1940) be consulted.

The precipitation hardening or age hardening theory suggested many possibilities of modification, improvement, and development of alloys by heat treatment. Conversely it brought awareness as to the probable instability (and consequent unsuitability) of some alloys, particularly for elevated temperature service.

Important as this field is practically, there are but scant references to age hardening in the *Transactions*—specifically three in the 1930-1940 Index. To some degree this may be due to hesitancy toward encouraging "scientific" papers in the nonferrous programs. Perhaps the existence of many patents, and the numerous types of alloys involved both contribute to lack of interest on the part of foundrymen. Alloys susceptible to heat treatment can be subjected to close controls, and their properties modified to fit particular needs. Their stability and uniformity can be assured.

The hardening of "pure" nickel by silicon is illustrative.

When silicon is added to "pure" nickel there is (as shown in chart, Fig. 8) a gradual increase from 75 BHN with no silicon to about 125 BHN at 4.0 per cent silicon at "aging" temperature of 1100 degrees Fahr. Beyond that percentage there is a rapid increase, with increase in silicon to a maximum of 450 BHN at 9.0 per cent silicon. At approximate eutectic composition, 10 per cent silicon, the alloy has as cast some 437 BHN. This composition was so brittle that heat treatment was not tried.

As quenched from 1800 degrees Fahr. ("solution treatment") the alloy with 6 per cent silicon can be held to a machin-

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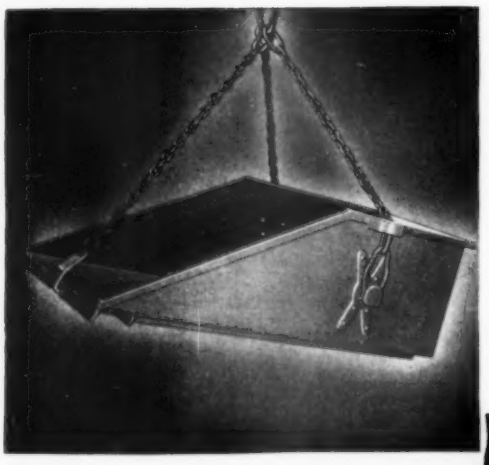

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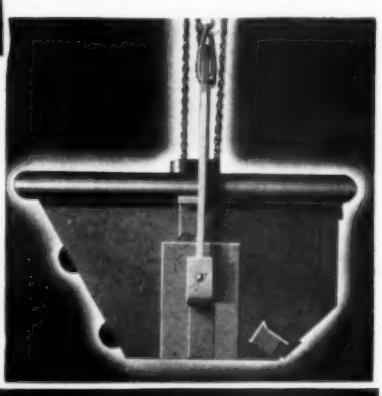

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ing hardness of 150 BHN with an attainable hardness of 350 BHN. (See diagram Fig. 8*.) Thus an alloy can be cast, then quenched, to a hardness at which machining is conducted with ease, and subsequently drawn to a high hardness to resist wear, etc. This sequence is the opposite of that employed in hardening steel.

Nickel-copper alloys compare favorably with "pure nickel" alloys in a number of corrosive media, and are preferable in foundry manipulation. Corson recognized the hardening effect of silicon in certain high nickel-copper alloys. One base composition reactions were fairly well worked out by Bothwell and by Corson (apparently independently). Bolton and Weigand worked with the 50-50 nickel-copper base and developed the exact combinations of composition, temperature and time to insure a practical and useful result—a highly machinable alloy about 160 BHN, readily hardened to 350 BHN without any danger from cracking. Many hundreds of thousands of castings have been made under high production machining, and have given an excellent account of themselves in service.

Silicon Increases Hardness

The addition of copper to the system lowers the silicide solubility. Using 350 BHN as a relative "measuring stick," pure nickel base requires about 6 to 7 per cent silicon, 70-30 nickel-copper base approximately 4.0 per cent, 50-50 nickel-copper base approximately 2.4 per cent. In alloys with as little as 10 per cent nickel only 0.10 per cent silicon is required to produce perceptible hardening.

It will be understood that with each composition a different combination of time and temperature is needed to produce optimum results. Also the substitution of a complementary base (in this case copper) has effects beside and beyond effects on hardness and on solubility—for example on ductility, strength, and the like.

The presence of a fourth element may have a marked effect on solubility. In commercial practice one does not work with metals of high purity; several elements beside the base elements and "hardener" usually are present.

For a given base there usually are several "hardeners." In the nickel-copper

*An early published work is that of Dahl and Schwartz (*Metallwirtschaft* Vol. 11, May 13, 1932 pp. 277-279). Weigand and the writer ran a series of tests covering part of the field in 1934. Later A. J. Smith ran a more complete series, using techniques markedly superior to those of earlier investigations. He was able to attain higher hardness maxima. The curves drawn are based on Smith's work. The equilibrium diagrams available seem very questionable. For example, that of Iwase and Okamoto, Sci. Repts. Tohoki Imp. Univ. 1st Series, Honda Anniversary Vol. 1936 pp. 777 indicates constant composition of 5.3 per cent silicon soluble at temperatures below 1900 degrees Fahr. All the results shown by Dahl and Schwartz, Weigand, Smith and the writer indicate that Iwase and Okamoto are in error. Results of age hardening studies, also creep tests cause the writer to be suspicious about many of the published equilibrium (?) diagrams on systems where limited solid solubility is involved. Not infrequently the real solubilities are much lower than indicated on the diagrams. This leads to dangers from intergranular precipitation, embrittlement, and failure.

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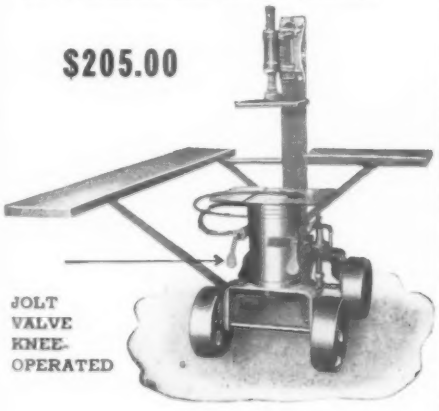

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base alloys, silicon, tin, aluminum and beryllium are among several agents.

In some alloys advantages can be taken of the possibilities of "cumulative" action, or one can use the same agent and a different base, a means by which the writer and Smith produced up to 650 BHN in a straight silicon hardened alloy.

A shortcoming of many age hardening alloys is a tendency toward intergranular precipitation, embrittlement, cracking, and preferential corrosive attack. The harder nickel-silicon and nickel-copper-silicon alloys, without certain modifications, are under some conditions subject to this trouble. The writer discovered suitable inhibitors that provide immunity from such failure.

It should be mentioned that overaging can take place readily in most age hardening systems. Too high a temperature, although it may speed the reaction tremendously, also may result in failure to attain optimum properties.

There are many cases where age hardening is not wanted. Extension of age hardening studies to our engineering alloys promotes their safe usage. Sometimes a very tiny amount of an age hardening element may cause serious impairment in properties. In some work undertaken cooperatively between Harder, Gillett, Gonser, Weigand, Milligan and the writer, it was found that a ductile 10 to 15 per cent nickel-copper alloy with manganese and iron can be completely embrittled with a few hundredths of a per cent of silicon. This embrittlement shows up after long time exposure to temperature and stress.

Bronze Breaks Down

It has been shown that the familiar 88-10-2 bronze breaks down rapidly at temperatures in the neighborhood of 500 degrees Fahr. (stress present) with precipitation of the delta constituent[24]. This reduces the ductility of the alloy and makes it unfit for engineering usage at that temperature. This finding influenced permissible temperature in code regulations. The "M" or 88-6-4-2 alloy is far superior.

A number of new alloys have been proposed as substitutes for older bronzes. Prominent among these are the silicon bronzes and brasses. Any new alloy should be investigated carefully for aging propensities. If elevated temperature application is contemplated, such investigation should be thorough. Aging may harden and strengthen the alloy with little loss in ductility. In some alloys aging may even increase the ductility, or it may cause embrittlement. Aging studies should cover hundreds of hours of test, at temperatures slightly above contemplated temperature of operation.

In cast alloys solidification processes promote some segregation. If diffusion is not rapid, and if homogenizing treatments are not used, segregation persists. In such cases local precipitation or age hardening may be a result.

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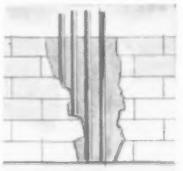

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More dope? *See page 18*

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desires stable and uniform materials. Heat treatments permit control beyond the "as cast" structure. It is probable that in the years to come heat treated foundry alloys will be used more extensively, and possibly supplant a number of the alloys in use today. The field is relatively new, the possibilities attractive.

There remains much interesting and useful work to be done over and beyond the present good efforts of the nonferrous division. The active workers in this division have indeed given much in time and effort, and they have been objectively cooperative. Two handicaps are the great diversity of alloys and the comparatively small number of men really active in this field. There appears room for further elementary exposition of structural metallurgy in the *Transactions*. Beyond that there is need for correlated abstracts and summaries. More development in fundamental theory would be useful. Some ordinary everyday matters, such as designs of test bars, might well be subjects for cooperative research. There appears to be room for extension of direct cooperation with other technical societies, on projects of mutual interest. Certainly there is room for more extensive direct participation and support by a greater number from the many nonferrous foundries.

The war has forced many and rapid changes in nearly every nonferrous foundry. This progress doubtless will be reflected promptly in expansion of association activities and in the advancement of this branch of the castings industry.

(To be concluded next month)

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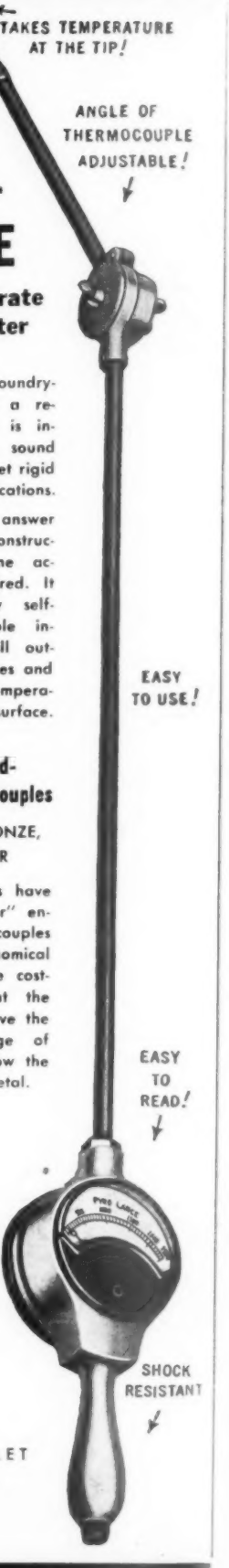

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Book Review

Metallurgical Problems, by Allison Butts; 6 x 9 inches, 446 pages, published by McGraw-Hill Book Co., New York, price $4.00.

This is the second edition of this work which first appeared in 1932, and has been revised to bring it up to date with respect to changes in fundamental data used in metallurgical calculations and with respect to changes in metallurgical practice, to clarify the text and arrangement, and to make available new problem material. The book is divided into 25 chapters of which the first three cover quantities and units, the chemical equation and combustion. Manufacture of coke and producer gas, thermochemistry and thermophysics, and the iron blast furnace are discussed in the next three while the bessemer, open-hearth and electric steel processes, production of blast and draft, and heat balance are described in Chapters VII, VIII, and IX.

Heat balance, calculation of smelting charges, and mass law and chemical equilibrium are the topics of Chapters X, XI, and XII. Chapters XIII and XIV relate to drying and calcining, and roasting and sintering, while copper smelting, electrolytic processes, and hydrometallurgy are discussed in Chapters XV, XVI, and XVII. Metallurgy of aluminum and magnesium, volatilization, metallurgy of lead, transfer of heat, and distillation processes are described in the next five chapters, while the remaining chapters are devoted to vapor pressure and temperature-pressure relations, thermodynamics, tables and index.

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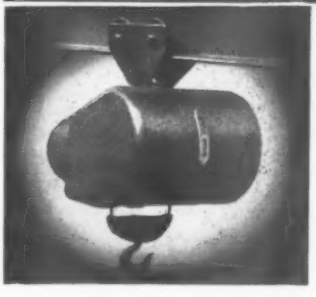

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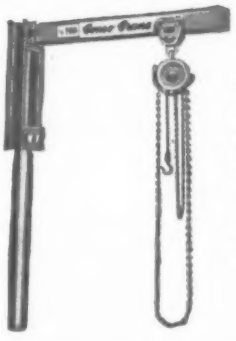

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Refractoriness of Steel Sand

(*Concluded from page* 171)

are responsible for other type defects. Studies should be made on commonly used types of sands to ascertain their properties at elevated temperatures. Also these sands should be studied by varying their composition with a view to improving their high temperature properties. This is an important field of investigation. There are many avenues of research that can be followed. A problem along these lines could be carried on for many years without exhausting the many phases that need examination.

"The problem could be started by working with a typical green sand commonly used in the industry. The high temperature properties should be determined. Additions of various binders should be made and other changes in the basic mix should be instituted followed by high temperature testing to ascertain the effects of the added materials. An attempt should be made to develop the best type of green sand mix for small and large green castings. Numerous other side line problems will be encountered during the course of the investigation."

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From a paper presented at the Regional Foundry Conference held at Milwaukee early this year.

THE EDITORS.

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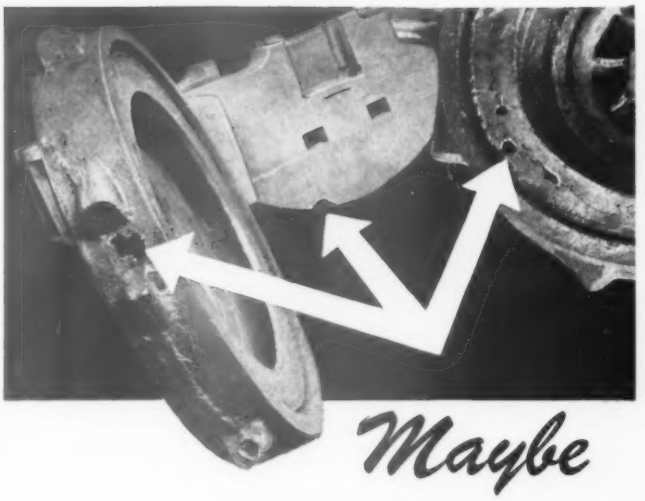

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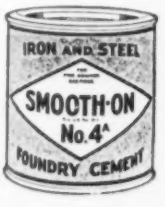

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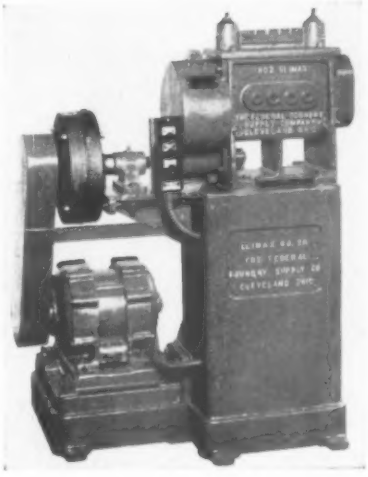

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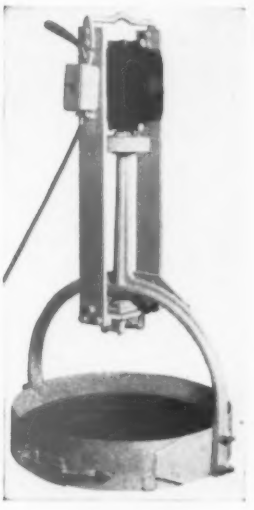

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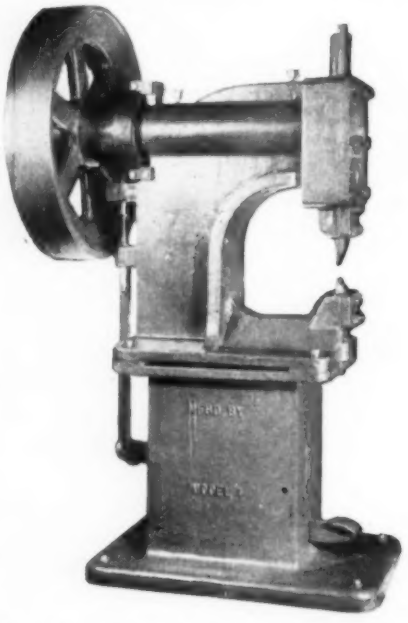

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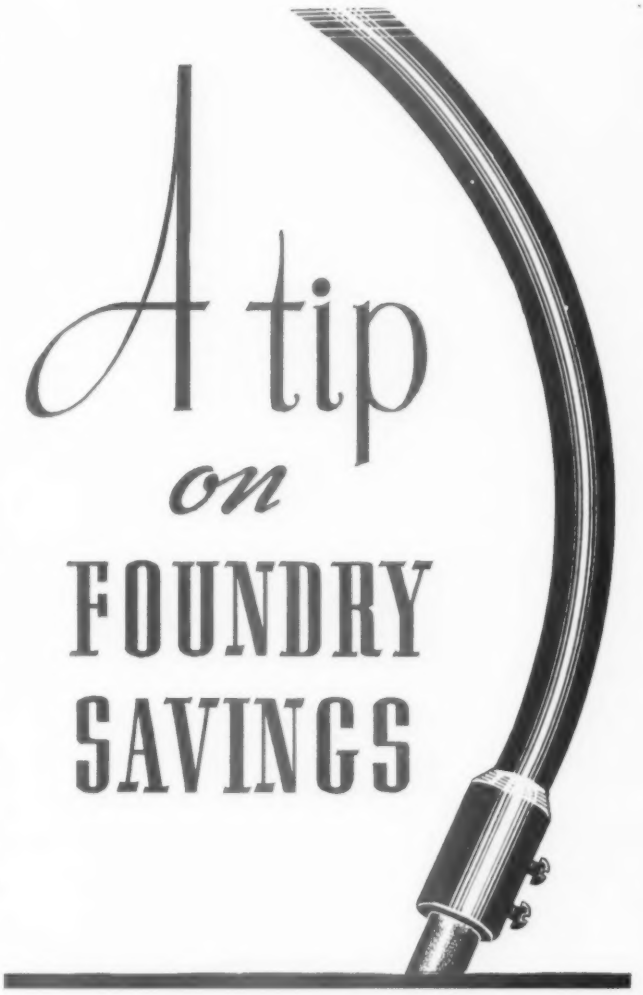

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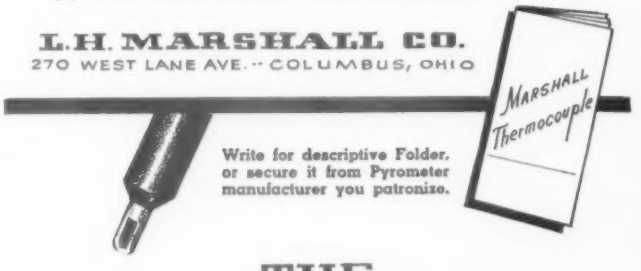

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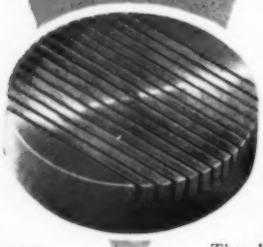

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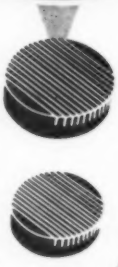

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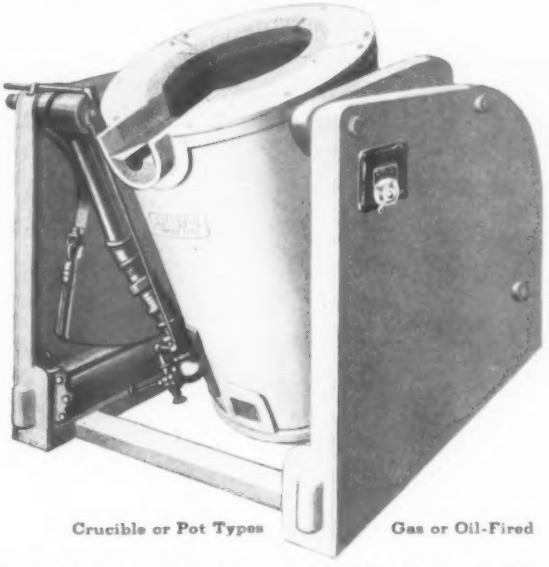

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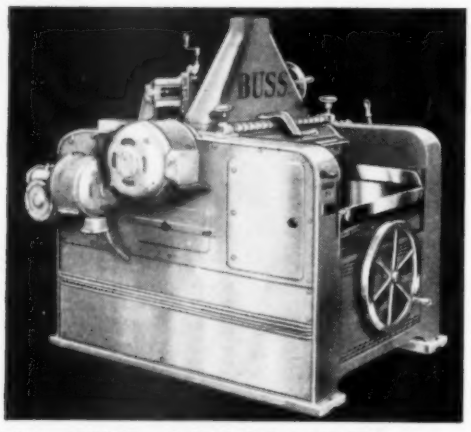

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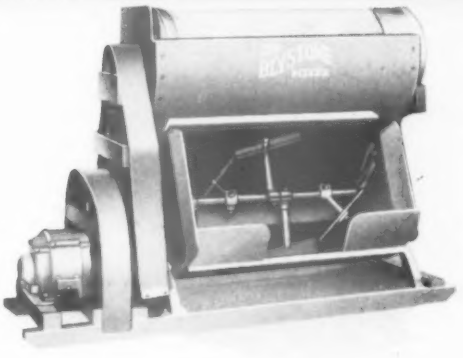

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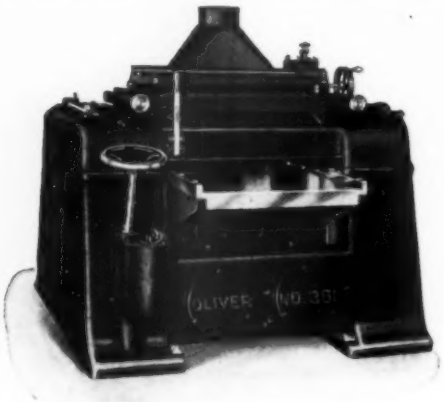

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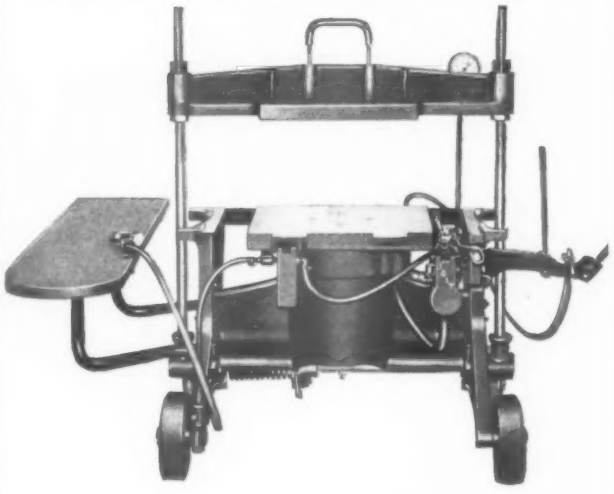

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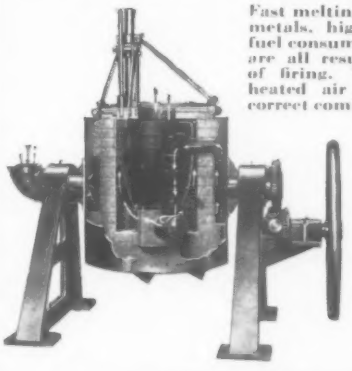

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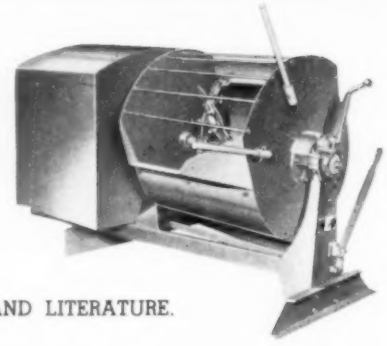

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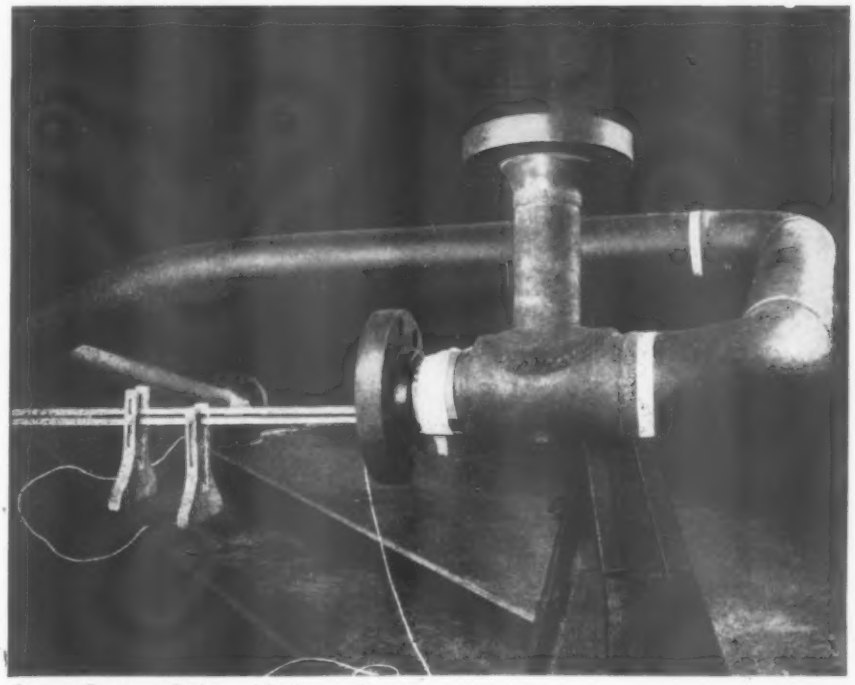

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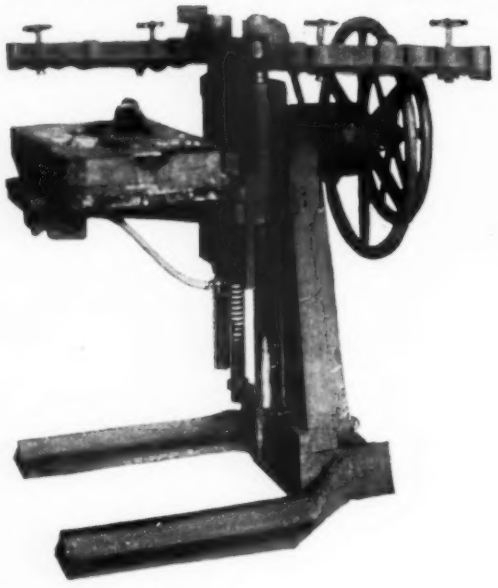

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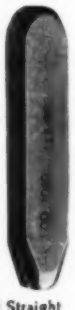
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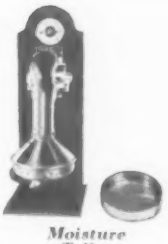

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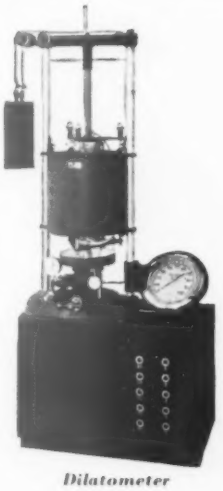

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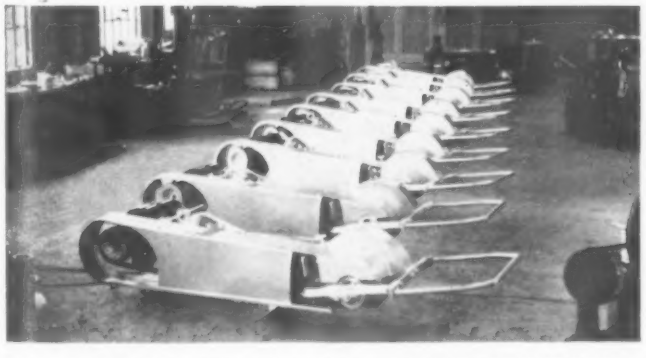

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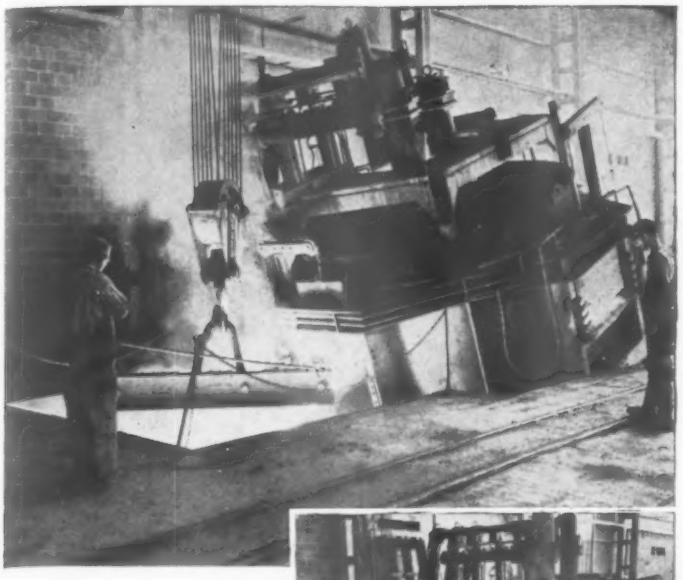

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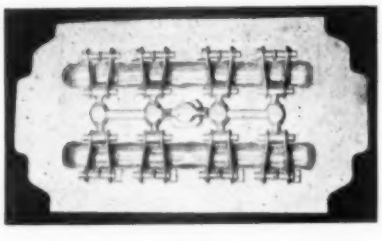

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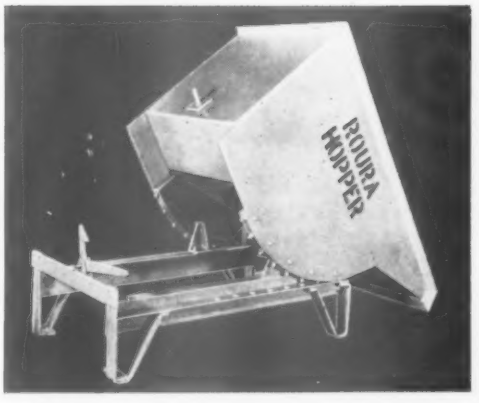

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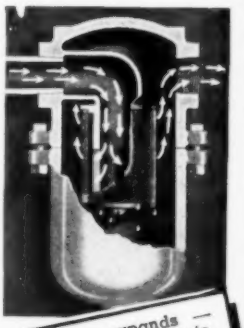

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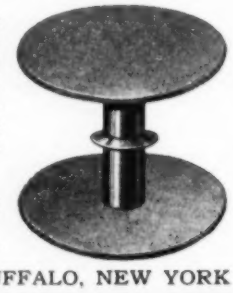

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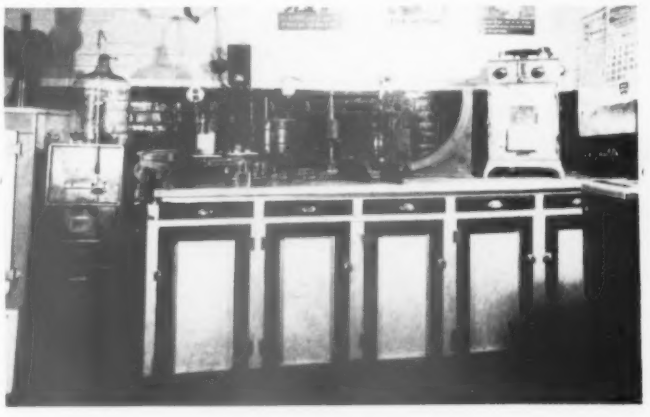

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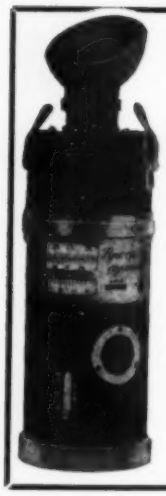

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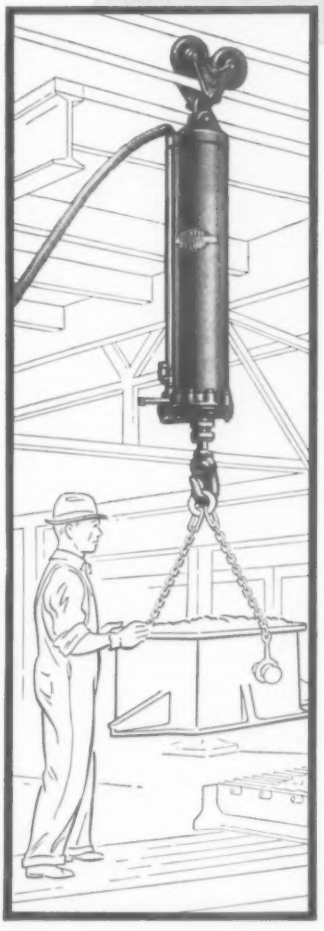

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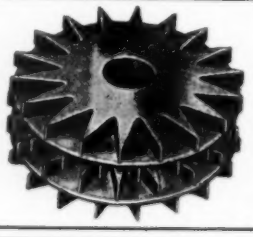

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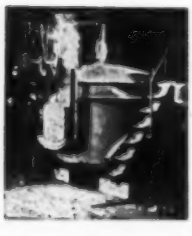

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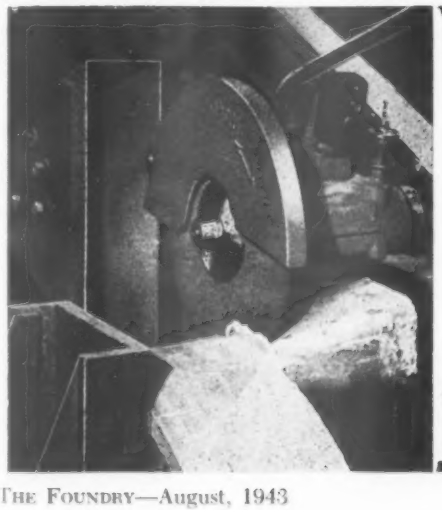
Sectional view of Peerless Springless Vibrators

PEERLESS TOOLS, Inc.

MILFORD, CONN. U.S.A.



WEST CUT-OFF WHEELS

The only wheel developed especially for the cutting of gates and risers

THERE IS A WEST WHEEL FOR EVERY NONFERROUS, STEEL OR IRON CUTTING JOB

THE WEST COMPANY

1117 SHACKAMAXON ST., PHILADELPHIA, PA.

Classified Advertising

Help Wanted

SUPERINTENDENT

For large malleable foundry. Good opportunity for one who can demonstrate real ability. If your application is to receive full consideration, it must give complete details as to business connections, exact duties, references, age, draft status, salary expected, and how soon available.

ADDRESS: BOX 132 The FOUNDRY
CLEVELAND, OHIO

UNUSUAL OPPORTUNITY—MALLEABLE IRON

We are looking for a foundry capable of supplying us with 100 tons per month of production castings weighing from ½ to 7 pounds each. Clean cut job—no cores. Peace time requirements will equal present war needs. Will contract with reliable source.

BOX 176
The FOUNDRY CLEVELAND, O.

METALLURGIST

For medium size plant with gray iron foundry and heat treating department. Basic college course in metallurgy and limited experience in ferrous metallurgy required. Permanent position with excellent opportunities. Location in Southwest. State education, experience, age, draft status and other particulars including recent photograph in first letter. Essential worker applicant must have war manpower commission certificate of availability. Address: Box 164, The FOUNDRY, Cleveland.

FOUNDRY ENGINEER

To look after the care and maintenance of machinery and equipment. Must be a practical man, thoroughly experienced in all important measures and precautions necessary to get the maximum life out of machinery and tools in a highly mechanized Foundry. To such this position offers a broad opportunity. In confidence, wire past experience fully, age, basic and technical education, draft status and starting salary. Address: Box 188, The FOUNDRY, Cleveland.

ATTENTION SALESMEN!

Representatives now calling on foundries regularly are wanted by a well-known manufacturer of high grade line of plumbago, facings, parting, blacking, core wash and allied foundry items. Liberal commission basis. Please advise territory covered, lines now handled, experience with foundry items, etc. Address Box 217, The FOUNDRY, Cleveland.

FOUNDRY FOREMAN

By a large Chicago Gray Iron jobbing production Foundry, handling light and medium castings, largely on squeezer and molding machines. State in your reply your age, experience fully, draft and family status, also salary expected. All applications confidential. Unusual opportunity for man who has been successful in obtaining maximum production. Address: Box 185, The FOUNDRY, Cleveland.

FOREMAN

To take charge of Steel Castings Cleaning & Finishing Department in large Chicago production Foundry, established 50 years. We require an experienced man who has a satisfactory record in handling all types of Cleaning Room Labor. To such, this opening presents an unusual opportunity. Now on defense work, but post-war outlook favorable. Address: Box 186, The FOUNDRY, Cleveland.

Help Wanted

METALLURGIST

Experienced, to supervise Metallurgical control of Gray Iron, Alloy Iron and Steel, in our several Foundries producing a large castings tonnage. Cupolas and Electric Furnace. Write us in confidence your past experience in detail, basic and technical education, draft status, and expected salary. Address: Box 189, The FOUNDRY, Cleveland.

MELTER

Experienced Electric Furnace Melter in large steel Foundry. Good salary and favorable prospects. Now in defense work, but large post-war business assured. First letter must state past experience in detail, age, draft status, education or training, and salary desired. All applications considered in strict confidence. Address: Box 187, The FOUNDRY, Cleveland.

WORKING FOREMAN

Small, busy jobbing brass foundry in New York City. Experienced, bench work and knowledge of molding machines. Permanent position with old established responsible corporation with unusual post war future. Write fully stating age, experience, salary. Address: FOUNDRY, P. O. BOX 6, STATION A, NEW YORK, N. Y.

COST ACCOUNTANT WANTED

Large gray iron foundry in middle west specializing in medium and heavy castings desires experienced cost accountant. State age, education, experience, draft classification and salary desired. Address: Box 184, The FOUNDRY, Cleveland.

CORE ROOM FOREMAN

Experienced man for jobbing malleable iron foundry, light and medium castings. Excellent peace-time opportunity for the right man. Write, giving complete qualifications, age and previous experience. Address: Box 180, The FOUNDRY, Cleveland.

MALLEABLE FOUNDRY FOREMAN

Central New York State foundry desires foreman. Man with molding experience or background and capable of setting up and maintaining production. Excellent post-war connection. State age—experience and how soon available. Address: Box 182, The FOUNDRY, Cleveland.

WANTED

Steel and gray iron molders
Union shop

N. & S. FOUNDRY COMPANY,
SEATTLE, WASH.

FOUNDRY SUPERINTENDENT

Capable of taking complete charge of gray iron and steel foundry with cupola capacity of 200 ton and steel capacity of 24 ton. Plant located in the Middle West with employment of 500 in Foundry Department. Address: BOX 177, The FOUNDRY, CLEVELAND.

FOUNDRY SUPERINTENDENT

Or Head Foreman with practical experience on light and medium Gray Iron and Alloy castings. Practical experience in training and handling men as well as a general knowledge of the business, chief requirement though technical knowledge would be advantageous. Age preferred 35-50. Address: Box 175, The FOUNDRY, Cleveland.

Positions Wanted

SUPERINTENDENT—METALLURGIST

Graduate metallurgist. Age 46, married. Twenty-one years research and production in iron—steel—alloys—nonferrous—aluminum. Practical experience in all types of furnaces. Know sands, cores and molding technique. Experience not heavily utilized in present position. Permanent position desired. Locality New Jersey or East. References. Address: Box 181, The FOUNDRY, Cleveland.

Positions Wanted

MALLEABLE FOUNDRY FOREMAN

Excellent opportunity in jobbing shop for practical foundryman who wants assurance of a post-war position. Write, giving complete qualifications, age and previous experience. Address: Box 179, The FOUNDRY, Cleveland.

FOUNDRY MANAGER & METALLURGICAL ENGINEER GRADUATE—FIRST CLASS

Twenty-five years' experience in all phases of foundry operations in Steel, Gray Iron and Non-Ferrous Metals, desires change with firmly established concern where his executive ability can be fully used and remunerated. Age 46. Address: Box 113, The FOUNDRY, Cleveland.

FOUNDRY SUPERINTENDENT OR MANAGER

Forty years' practical and technical experience in all lines and metals. Sixty years of age. Can manage and handle men successfully. Active and energetic. Prefer Middle West and West Coast. Address: Box 101, The FOUNDRY, Cleveland.

NONFERROUS FOUNDRY FOREMAN

Broad practical experience including steam valves, high pressure castings, chilled castings and general jobbing and production work. Prefer position with manufacturing plant. Address: BOX 160, The FOUNDRY, CLEVELAND.

STEEL FOUNDRY MANAGER

If you are looking for a steel foundry manager, may I present my credentials and talk with your officials? Address: Box 190, The FOUNDRY, Cleveland.

STEEL FOUNDRY SUPERINTENDENT

Capable of taking complete charge. Thirty years practical and technical training. Experience covers every phase of the steel foundry. Now employed, would like to make a change. A-1 reference. Address: Box 191, The FOUNDRY, Cleveland.

FOUNDRY FOREMAN

Experienced foundry foreman wants charge of gray iron shop running about twenty tons per day. Thoroughly experienced in molding and cupola practice. Address: Box 109, The FOUNDRY, Cleveland.

ENGINEERING SERVICE

If your production is low and your loss high, if you feel that general inefficiency prevails in your foundry, let me explain an inexpensive method. Address: Box 959, The FOUNDRY, Cleveland.

FOUNDRYMAN

With over 20 years' experience in gray iron and semi-steel desires position as foreman in gray iron foundry. Practical experience as molder and foreman. McLain graduate. Best reference. Address: Box 145, The FOUNDRY, Cleveland.

FIRST CLASS BRASS MAN

Metal and molding expert. California or the coast preferred. Address: BOX 178, The FOUNDRY, CLEVELAND.

GRAY IRON FOUNDRY EXECUTIVE

Capable gray iron foundry executive desires position as foundry supply salesman or castings salesman in or near Chicago. Am at present employed. Excellent references as to character and ability. Address: Box 197, The FOUNDRY, Cleveland.

Classified Advertising

Positions Wanted

FOUNDRY MANAGER OR SUPERINTENDENT

Desires to make connection with a gray iron production foundry. Experienced in all foundry applications. Successful operator. At present employed. Address: Box 196, The FOUNDRY, Cleveland.

DEMONSTRATOR SALESMAN

Experienced in application of Core and Mold Washes and General Foundry Practice. North Atlantic States. Address: Box 997, The FOUNDRY, Cleveland.

GENERAL MANAGER

Mature, profit-minded, dependable. Has successfully managed four companies—taken two out of the red. Available for service shortly with medium-sized company requiring reliable directing ability in management, sales, finance and production. Extensive experience foundry, machinery, tool and related lines. Address: Box 199, The FOUNDRY, Cleveland.

CORE ROOM OR FOUNDRY FOREMAN

Fourteen years as core room foreman and twelve years foundry foreman. Stove furnace light and medium machinery casting. Can furnish good reference. Address: Box 195, The FOUNDRY, Cleveland.

SALESMAN

Twenty years' practical experience. Wishes position foundry supply sales. Sales experience—willing to relocate. Address: Box 173, The FOUNDRY, Cleveland.

FOUNDRY SUPERINTENDENT

Fully experienced in nonferrous metals—light, medium and heavy castings. Rigging, gating, cost estimating, blue print reading and core room production. Neat appearing and aggressive. Age 42. Thorough experience as foundry superintendent. Address: Box 194, The FOUNDRY, Cleveland.

FERROUS AND NONFERROUS FOUNDRY SUPERINTENDENT

A THOROUGHLY TRAINED, ACTIVE FOUNDRY SPECIALIST IS AVAILABLE AT SHORT NOTICE. WIDE EXPERIENCE AS TROUBLE SHOOTER AND PRODUCTION BOOSTER. ADDRESS: BOX 192, The FOUNDRY, CLEVELAND.

SALESMAN, GRAY IRON CASTINGS

Knows costs and able to quote prices intelligently. Twenty years' practical experience. Prefer Ohio or Michigan. Address: Box 170, The FOUNDRY, Cleveland.

SUPERINTENDENT AND GENERAL MANAGER

Twenty-three years' practical experience small gray iron jobbing shop. Foreman. Charge of production, sales and purchases. Castings from one lb. to three tons. Green and dry sand. Address: Box 172, The FOUNDRY, Cleveland.

FOUNDRYMAN

Desires position as foreman of jobbing brass foundry. Thirty-eight years old, 20 years' experience as molder, coremaker and foreman. Good rigger. Can handle help and train green help. Do own alloying. Experienced on monel, nickel, silicon bronze, aluminum bronze and manganese bronze. Now employed but desires change with post-war future. Address: Box 193, The FOUNDRY, Cleveland.

IRON FOUNDRY GENERAL MANAGER

Desires position having charge of all departments, including Sales, Production, Personnel, Office, etc. For ten years actually worked in all foundry departments during which time studied Cost Accounting and Management. Served five years as Cost Accountant and Assistant Manager of Stove and Jobbing Foundry and for the past two years very profitably managed a jobbing foundry. Excellent references from former connections. Desire position on salary and percentage of profits basis. Address: P. O. Box 322, Reading, Penna.

Wanted-To-Buy

WANTED

Two No. 333 Osborn Jolt Roll-over Squeeze pattern draw molding machines with swing-out table.

Two No. 433 Osborn Jolt roll-over Squeeze pattern draw molding machines with swing out table.

Frank Foundries Corp. Moline, Ill.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland.

WANTED

Production patterns for sash weights. State condition and price in first letter. Address: Box 158, The FOUNDRY, Cleveland.

WANTED

Small gray iron foundry. Equipped to handle castings 100 lbs. to three ton range. Prefer Ohio or Michigan. Address Box 171, The FOUNDRY, Cleveland.

SANDCUTTER WANTED

Model AA American Sandcutter, equipped with 60" cutting cylinder. State condition, age, lowest cash price for immediate delivery. Address: Box 198, The FOUNDRY, Cleveland.

Foundries for Sale

FOUNDRY—BRASS—COPPER—ALUMINUM

Established 30 years; sales $500,000 year; 10 month backlog; brick building, 10,000 sq. ft. fully equipped; over crane; 6 furnaces; total capacity; 3 ton metal flasks; room for expansion; excellent personnel; located near Cleveland; Good earnings; employ 50; low overhead; dissolving partnership; sell complete. For details

THE APPLE CO. EST. 1905
BROKERS CLEVELAND, OHIO

FOUNDRY FOR SALE

Small but fine foundry for sale in Reno. The only one in the state of Nevada operating for customers. Excellent profits guarantee. Selling on account of army service. Address: Galli Foundry, Reno, Nevada.

FOR SALE

Completely equipped foundry and stove factory on railroad siding, now in operation located in mining town in Northern Mexico. For particulars address: F. P. Low, Apartado Postal 3, Parral, Chih., Mexico.

Foundry Wanted

WANTED

A small foundry within fifty miles of Pittsburgh, Pa. The only equipment required in the plant would be a cupola with blower and controls. Submit price and complete details. Address: Box 157, The FOUNDRY, Cleveland.

For Sale

FOR SALE

1—Chicago Pneumatic Air Compressor 12" x 14", 75 HP, switch box and starter, complete for operation, $100.00.

1—10" x 10" Bury Air Compressor, 40 H motor, switch and starter, $900.00.

1—G. H.-2 Pangborn Sand Blast Barrel, complete with air tank, elevator, hopper, $200.00 worth of new parts, $900.00.

1—275 gal. Fuel Oil Tank with Oil Pump and motor, $250.00.

1—Howe Portable Platform Scales, 4 ft. square platform, $225.00.

1—Herman Roll Over Machine.

This equipment has all been rebuilt.

HAYNES FOUNDRY EQUIPMENT COMPANY
1734 LAKE ST. KALAMAZOO, MICH.

USED TRANSFORMER FOR SALE

1—General Electric Circular Coil H Design, Transformer for Arc Furnace, No. 2297426, Type WCT Form HDDP, 60 Cyc., 500 KVA Continuous 55 degree, C. Rise, Rated volts full winding 12575 to 100. Operating volts full winding 13200 to 100 at .90 P.F. Delta primary, for indoor installation only. Equipped with thermometer, oil level gauge, vent, oil and water connection valves. Height overall 90 inches; width 32 inches. Overall length with connections 77 inches. Approximate weight 8000 pounds. This Transformer is in excellent working condition.

THE BREWSTER COMPANY, INC.
SHREVEPORT -:- LOUISIANA

AIR COMPRESSORS

BELTED—176 ft., 355 ft., 540 ft., 676 ft., 752 ft. & 1300 ft.
ELECTRIC—355 ft., 528 ft., 676 ft., 807 ft., 1302 ft., 1723 ft., 2022 ft., 2200 ft., 2800 ft., 3600 ft., & 5000 ft.

STEEL TANKS

9—5000 gal., 11,500 and 18,000 gal. cap.
17—1000 bbl., 4000 bbl. and 10,000 bbl. cap.

TANKS BOUGHT AND SOLD

R. C. STANHOPE, INC.
60 East 42nd St. New York, N. Y.

FOR SALE

Type G. F. Pangborn Rotoblast complete with loader and motors; can be inspected in operation Elkhart, Indiana; owner replacing with larger sandblast. Address: Box 183, The FOUNDRY, Cleveland.

FOUNDRY EQUIPMENT FOR SALE

Completely equipped Brass Room with ½ ton Electric Hoist and overhead track. Also other foundry equipment. Write for list and prices. Address: A. C. OSBORN, VIRGINIA, MINN.

SECOND HAND MACHINERY

COMPLETE SAND DRYER

Rotary drier 80" in diameter and 40' long. Also all necessary auxiliary equipment including conveyors, elevators, exhaust fan, motors, starters, etc. Address: Box 994, The FOUNDRY, Cleveland.

FOR SALE

One Detroit Electric Furnace and transformer, one ton capacity. Price $1,500.00.

New Haven Foundry,
New Haven, Mich.

CENTRIFUGAL COMPRESSOR

350/400 Cfm @ 35 lbs., 3 stage Allen & Billmyre, 6 x 6½ Centrifugal Compressor with 15 H.P. 3600 RPM AC motor drive.

SAND VIBRATOR

Jeffery-Traylor, shaker type CVS-8, 6" wide hand deck, capacity 7 to 8 tons sand per hour; with 15 cycle, 110 volt, single phase vibrator motor generator set. Write, wire or phone.

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE. CLEVELAND, OHIO

Classified Advertising

For Sale

SPECIAL DEFENSE BARGAINS

Cast Iron and Steel Plate Mill-Dust & Shavings Exhausters 50 in stock. **Cupola and Furnace** Blowers for Coke, Oil or Gas Combustion.

Brass Foundry Furnaces: No. 2—42"—class A Schwartz, with or without blower.

Two Monarch Rotating Barrel type furnaces each 500 lbs. per heat capacity, one newly carborundum lined.

1—Hausfeld No. 150 crucible size tilting furnace, oil or gas fuel.

1—Hausfeld 400 lbs. per heat capacity, complete —newly lined and with Electric Blower set attached, for 3/60/220 A.C.

1—Booth Electric Furnace with accessories 725 lbs. cap., with new unused extra cylindrical lining.

Can furnish stationary furnaces on short notice for crucibles No. 60 to No. 125 with swing top covers.

Molding Machines:

1—Tabor style—portable jolt squeeze 18" x 19" platen.

1—Woodison core machine, hand jolt-rollover-drawn for multiple core plate work.

1—Dings No. 2 Magnetic Separator with AC-DC Motor Generator Set.

1—Sly Cinder Mill for Cupola droppings or brass foundry skimmings.

1—F & M 25 H.P. horiz. oil engine, Diesel type.

1—Ransohoff Patented Round, ¾" thick steel Tumbling Mill work chamber 48" x 48" with star separating device, for wet tumbling, with 10 HP 600 RPM A C motor and transmission for direct connection, nearly new.

We especially solicit Blowers, Exhausters and Fan inquiries in this season.

CLIFTON MACHINERY CO.

1023 W. 6TH, CINCINNATI, OHIO

REBUILT

BLOWERS—FANS—EXHAUSTERS

Roots-Connersville positive cupola blowers. Centrifugal blowers for gas and oil burning. Sand blast, grinder end dust exhausters. Ventilating fans.

GENERAL BLOWER COMPANY

406 N. Peoria St. Chicago, Ill.

SURPLUS FOUNDRY EQUIPMENT

Cast iron flasks.
Steel bands.
Adjustable cast iron slip jackets.
Straight and tapered wood snaps.

1 Tabor 10 inch Cantilever Squeezer.

1 Rattler size 4 feet diameter, 6 feet long. Gear drive complete with gears, bearing, pulley, and counter shaft. Round bottom boards, 17 inch diameter.

1 Whiting Grey Iron Cupola Lined to 26" to 28". 19½ feet from dump bottom to top of stack.

1 Northern Grey Iron Cupola lined to 32 inches. Height from dump bottom to top of stack, 31 feet. Both Cupolas in working condition.

1 Tabor Air operated Jar Squeezer. Serial 19119-72" wheel spread. 72" high at peak. Table 27" from floor to table. Three wheels.

176 lbs. No. 6 Double cotton covered copper wire.
185 lbs. No. 8 Double cotton covered copper wire.
194 lbs. ¼x½ double cotton covered copper wire.
50 lbs. ⅛ sq. cotton covered wire. Electric Hoist No. 8448 Sprague Electric Works of General Electric Co. NP. 9714 ½ Ton.

1 20" 800 lb. Bull ladle on wheels.
1 20" 800 lb. Bull ladle with crane carrier.
2 13" 250 lb. Bull ladle with crane carrier.
22 50 lb. hand ladles and carriers.
2 75 lb. hand ladles and carriers.
1 40" diam. by 34" deep Bull ladle with crane carrier.
2 sets of bales 30 by 30 inches.
1 General Electric Centrifugal Air Compressor with Starting Compensator and Induction 10 H.P. 220 volt 3 Phase Motor.

BARRY COMPANY

MUSCATINE -:- -:- IOWA

For Sale

REBUILT EQUIPMENT IN STOCK

IMMEDIATE SHIPMENT

MISCELLANEOUS ITEMS

(1)—No. 60 Fisher stationary crucible Furnace, oil fired, new lining.
(1)—3-ton geared crane type Ladle.
(2)—1¾" Power Sprue Cutters.
(4)—Branford Shakeout Vibrators.
(1)—10" Tabor Post Type Squeezer.
(2)—1½-yd. Hayward 230-VDC. Elec. Buckets.
(1)—1½ yd. single Line Brosius Bucket.

ELECTRIC MONORAIL HOISTS

(1)—1½-ton Shepard, 1-motor, 220/3-60-cy.
(2)—1-ton Euclid, 1-motor, 110/230-VDC.
(3)—1 & 2 ton Shepard, 1-motor, 230-VDC.
(2)—1 & 2 ton Shepard, 2-motor, 230-VDC.

OVERHEAD ELECTRIC TRAVELING CRANES

TONS	MAKE	SPAN	CURRENT
(1) 1	Maris	35'7"	230-VDC
3	Euclid	30'0"	230/3/60-cy
5	Shepard	30'0"	230-VDC
7½	Northern	28'0"	220/3/60-cy
10	Whiting	32'0"	220/3/60-cy
10	American	54'1¼"	230-VDC
10	Morgan	58'2"	230-VDC
25	P & H	50'0"	A.C. or D.C.
75/25	Morgan	59'0"	230-VDC

Following two cranes are Underslung Type.

3	Armington	30'0"	230-VDC
3	Sprague	20'6"	230-VDC

Our large modern plant is equipped to rebuild any of these cranes to suit your requirements. Send us your motor inquiries—we have a large stock of Crane, Mill & General Purpose Motors.

T. B. MacCABE CO.

4304 Clarissa St. PHILADELPHIA 40, PA.

REBUILT USED EQUIPMENT

Molding machines, all types; tumbling mills; furnaces; cupolas; air compressors; hoists; rammers, all types; ladles, all types; sand mixers; sand blast tanks; core machines, etc. All equipment rebuilt and guaranteed. All sizes used steel flasks.

HAYNES FOUNDRY EQUIPMENT COMPANY

1734 Lake St. Kalamazoo, Mich.

FOR SALE

POWER PLANT

1—Fairbanks, Morse, 120 H.P. Stationary Diesel Engine, model 32B-2, two cylinder, 14 x 17, with tanks, etc.
1—Type AB 50 KVA 1200-3-60-240 Belted alternator.

FOUNDRY EQUIPMENT

1—12 x 14 Ingersoll-Rand ER-1 Air compressor with extra heavy air tank
1—No. 5 Bartlett Foundry & Machine Co. Brass Melting Furnace (COKE)
1—30" x 42" Tumbling Mill (Sly Mfg. Co.)
1—6B Volume Champion Exhauster

HINES ALUMINUM TAPERED SNAP FLASKS & JACKETS

1—15" x 24" and 12 jackets
3—12" x 22" and 18 jackets
2—11" x 22" and 12 jackets
1—17" x 19"

MISCELLANEOUS

2—"Skinner" Drill press vises
1—No. 2 Hosfeld Universal Iron Bender

REPLY

CARLISLE FOUNDRY COMPANY
CARLISLE, PA.

Foundry Work Wanted

WANTED
FOUNDRY & MACHINE SHOP WORK

MT. JEWETT FOUNDRY & MACHINE, INC.
MT. JEWETT, PA. PHONE 2371

Employment Service

GRAY IRON FOUNDRY EMPLOYMENT

We are receiving many inquiries for superintendents, metallurgists and foremen. We shall be glad to hear from qualified men. No charge.

Gray Iron Founders' Society Inc.
1010 Public Square Building Cleveland, Ohio

SALARIED POSITIONS

This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details.

R. W. BIXBY INC.

101 Delward Bldg. Buffalo, N. Y.

USED FOUNDRY EQUIPMENT

The demand for used foundry equipment of all types is urgent.

A short classified advertisement in The FOUNDRY will help someone locate much needed auxiliary equipment.

POSITION WANTED

Minimum advertisement set solid, 30 words $1.50. Additional words 5c each. Same advertisement all caps, 30 words $2.00. Additional words 7c each.

HELP WANTED

Minimum advertisement set solid 50 words or less $3.00. Additional words 6c each. Same advertisement all caps, 50 words $4.00. Additional words 8c each.

FOR SALE

Minimum advertisement set solid, 30 words or less $3.00. Additional words 10c each.

WANTED

Minimum advertisement set solid, 30 words or less $3.00. Additional words 10c each.

Miscellaneous advertisements such as "Personals", "Services" etc., minimum 30 words set solid, $3.00. Additional words 10c each.

Note: If replies are to be sent to a box number in care of The Foundry, add 6 words to your advertisement for box number and address.

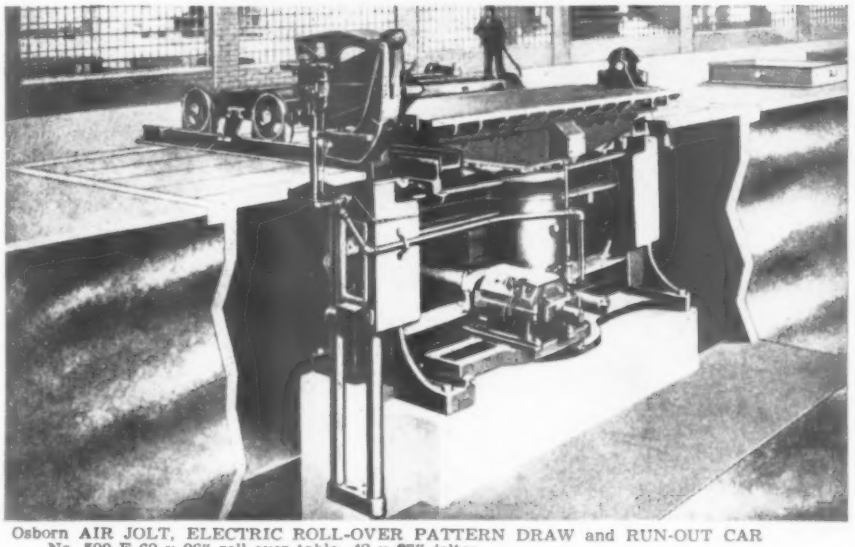
ADDRESS
CLASSIFIED ADVERTISING SERVICE

THE FOUNDRY
PENTON BUILDING CLEVELAND, O.

SCULLY Reconditioned Foundry Equipment

★ ALL SCULLY EQUIPMENT IS REBUILT AND OVERHAULED IN OUR OWN, NEW MACHINE SHOP

OSBORN MOLDING MACHINE

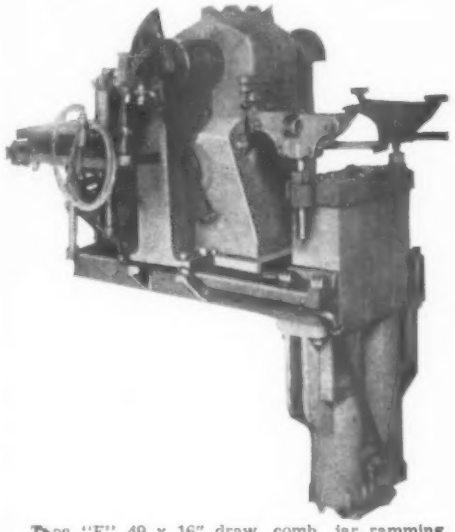


Osborn AIR JOLT, ELECTRIC ROLL-OVER PATTERN DRAW and RUN-OUT CAR
No. 509-E 60 x 96" roll-over table, 42 x 87" jolter.
No. 513-E 36 x 124" roll-over table, 36 x 112" jolter.

INTERNATIONAL MOLDING MACHINES

International Type "F" comb. jar ramming power turn-over, power draw (late type enclosed cyl. model) 27 x 16" draw, 1600 lbs. cap. @ 80 lbs. press.

International Type "F" comb. jar ramming power turn-over power draw, 26 x 12" draw, 900 lbs. cap.



Type "F" 49 x 16" draw, comb. jar ramming, power turn-over and power draw, fitted with air equalizers, rollers in the draw section and hand operated core box clamps (rollers can be readily removed) jar plate 100" long, 6000 lbs. cap. @ 80 lbs. pressure.

OSBORN Jolt Roll-Over Pattern Draw Molding Machines.

No. 403, flask cap 44x36" pattern draw 12"—1400 lbs. cap. @ 80 lbs. press., with swing-out Mold Table.

No. 405, flask cap 50x64"—pattern draw 18", 3000 lbs. cap @ 80 lbs. press. with run-out Mold Car.

JOLT SQUEEZE STRIPPERS

No. 142 Milwaukee, stationary, 1200-lb. cap. @ 80 lbs., 6" draw, table 19 x 35"—open end type.

No. 113 Milwaukee, open end type, portable, 500-lbs. cap. @ 80 lbs., 6" draw, 16 x 35" table.

Osborn No. 82 STRIPPING PLATE JOLT SQUEEZER, 46" between rods, 10" draw, 1200 lbs. jolting cap., 1000 lbs. stripping cap. 24 x 36" table, pin lifts 12" part one way, 36" the other.

Nicholls Type "D" stationary heavy duty JOLT SQUEEZE & PATTERN DRAW, squeeze piston 14" jolt piston 6", draw 2-6"—distance between strain rods 40" take approx. 15 x 24" flask.

NO. 2 DEMMLER CORE BLOWING MACHINES

MOLDING MACHINES

No. 49 Davenport jolt roll-over draw, outside flask cap. 50 x 72" pattern draw 18"—4500 lbs. cap. @ 80 lbs. pressure, jolt cyl. dia. 14".

No. 24 Davenport jolt roll-over draw, stationary, outside flask cap. 26 x 40"—10" draw, 1000 lbs. cap. @ 80 lbs. pressure.

Osborn No. 332 jolt roll-over and squeeze, flask cap max. length 36" width 26" pattern draw 9" jolt cyl. dia. 7", 750 lbs. jolting cap. @ 80 lbs. press., 44" between uprights.

HERMAN Independent Turn-Over and Pattern Drawing Device

60 x 84" roll-over, 60 x 72" bumper, 10,000 lbs. cap. @ 80 lbs.

60 x 72" roll-over, 60 x 72" bumper, 10,000 lbs. cap. @ 80 lbs.

40 x 56" roll-over, 40 x 58" bumper, 3000 lbs. cap. @ 80 lbs.

AMERICAN SANDCUTTERS

American Fdry Model "K" heavy duty type, size 72, equipped with Buda Type "MU" 20 HP Gas Engine. 72" between tractor wheels, 6" face, having 60" cutting cyl.

Model "AA" size 62, 66" between tractor wheels, 4" face—O/A width 85" Length 96" and Height 80"—equipped with 4 cyl. Waukesha Gas Engine.

NOTE—Can substitute suitable size and type MOTOR for either of above units, if required.

Cleveland-American (similar to Model "K") 84" spiral cutting cyl., 36" dia., 92" between tractor wheels, 5" face—equipped with Cleveland 3-phase 60 cycle 220V AC Motors, Cable and Take-Up Reel.

International Type "Y" HAND STRIPPERS

18 x 36 x 8" draw
18 x 18 x 10"
20 x 30 x 10"
20 x 36 x 10"
24 x 24 x 6"
24 x 30 x 6"
24 x 30 x 8"
(Also LOT miscellaneous other sizes and types, both portable and stationary)

OVERHEAD ELECTRIC TRAVELING CRANES

35-ton approx. 31'10" span Power House Type, 4-motors, 550V DC Motors, with Aux., Chain on Main Hoist, Cable on Aux.

10-ton approx. 30'7" span, 3-motor type, Northern Electrical 115V DC Motors, Hoist 15 HP 750 RPM, Rack 3 HP 1200 RPM, Bridge 7½ HP 950 RPM, EC&M Controllers, cage oper., 24" double "I" Beams, cast iron truck ends, chain lift (trolley drum can be regrooved for cable, if necessary).

Whiting BUCKET HANDLING DOUBLE DRUM CRANE. 4-motor type, cage oper., 230V DC Motors, drum type cont. approx. span 18'8" vertical clearance approx. 3'2"—7'0" track gauge end trucks have 15'0" wheel base.

3-ton MILWAUKEE 3-motor Type "C" GANTRY CRANE (suitable for 5-tons) 230V DC Motors, lattice type girders, structural end trucks, enclosed cage at one end, approx. span 31'6", lift 25 ft., overhang each side approx. 12 ft., single drum parallel with bridge girders, including ½ yd. single line perforated BUCKET for same.

ELECTRIC HOISTS

2-ton Northern Elec. Top Hook (can arrange for trolley—if required) floor control, approx. 18 ft. lift, speed 18 FPM, equipped with 5 HP 3/60/220 V AC Motor (suitable for 3 tons or more).

3-Ton Link-Belt single point suspension with Top Hook (or can add Trolley if required). Floor operated, mechanical lowering brake, 18' lift, speed 18 FPM, equipped with 115 volts, D.C. Motor, or can rewind for 220 V DC service.

4-ton Sprague Monorail Type "W" with motorized Trolley, 230 V DC Motors, double sheave-4-ropes, 25 ft. lift, speed 13 FPM, with open trailing cab.

5-ton Shepard Form 1 Class B-6 equipped with 6 HP 220V DC motor, floor control, 15 ft. lift, speed 15 FPM.

SCULLY MACHINERY & EQUIPMENT CORP.

(Formerly - Foundry Division of Scully-Jones & Co.)

2031 WEST 74th STREET (Phone PROspect 8770) CHICAGO 36, ILLINOIS

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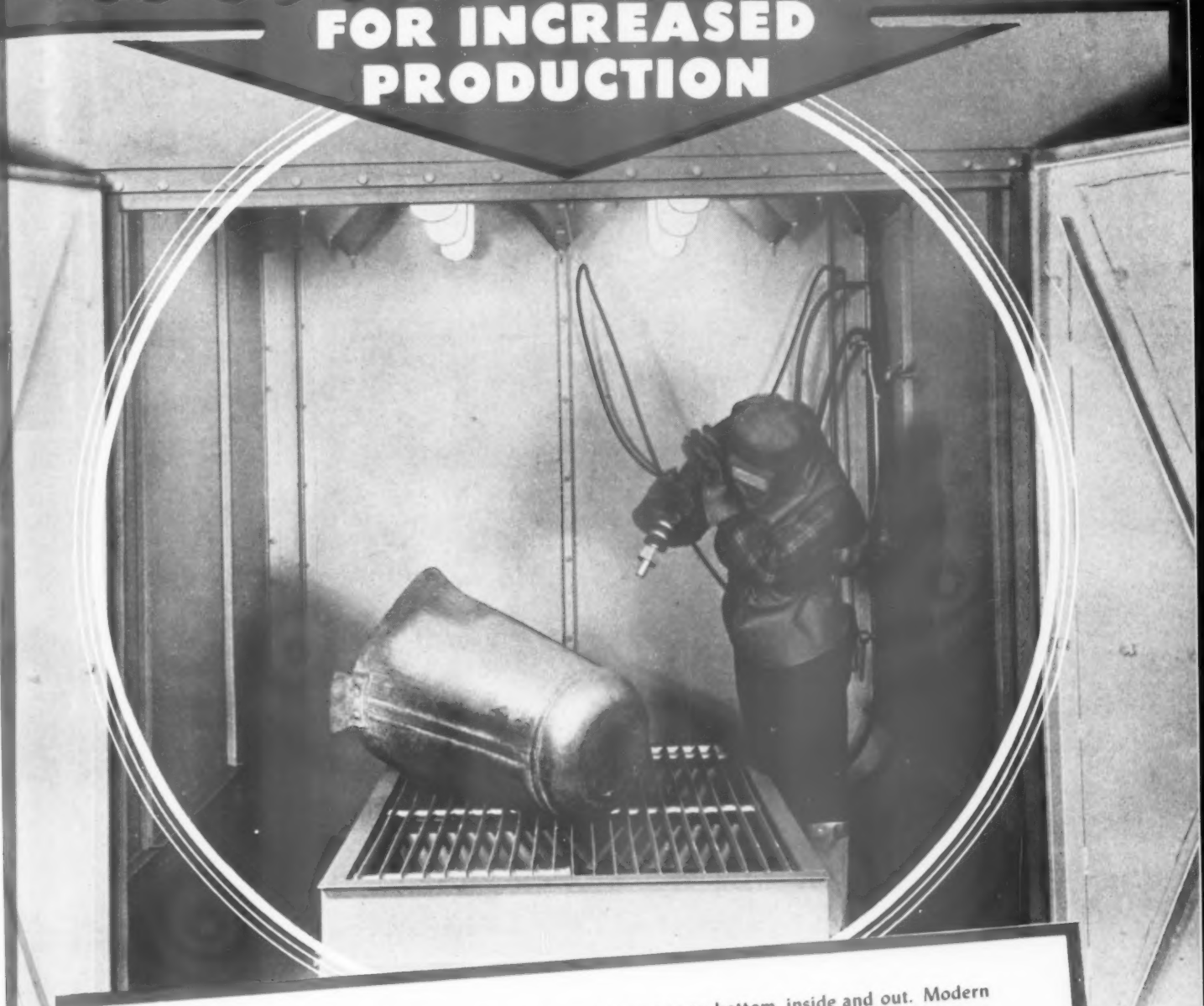
Parsons SAND-BLAST ROOMS FOR INCREASED PRODUCTION



PARSONS SAND BLAST ROOMS are engineered from top to bottom, inside and out. Modern in every respect construction, operation and performance. Better ventilation, better lighting with everything at the operator's fingertips . . . Par-Blast rooms are furnished in a number of designs, depending on the work or pieces to be cleaned. The Turntable, Car, Monorail and Small Cabinet Types are all outstanding in their particular field and have gained world wide recognition on performance and economy . . . You will find Parsons creative engineering in all types which means faster and more thorough cleaning, simplified and easier operation at lower operating costs. Send for free bulletin or better yet let us have your blast cleaning problems. We will be glad to suggest equipment best adapted to your specific work.

PARSONS *Engineering* CORP.

2545 EAST 79TH STREET • CLEVELAND, OHIO

Pouring
the Nation's Metal the MODERN Way

Installation of Modern Electric Pouring Device with Cylindrical Ladle in a prominent eastern foundry.

MODERN EQUIPMENT CO. Dept. 201

PORT WASHINGTON, WISCONSIN

Cupolas • Cupola Chargers • Covered & Insulated Ladles • Lifetime Geared Ladles •
Improved Bottom Pour Ladles • Metal Pouring Systems • Crane & Monorail Systems
For Metal & Mold Handling • Furnace Charging Cranes • Electric Mold Skin Driers

MODERN EQUIPMENT CO
PORT WASHINGTON, WIS

2 Important Considerations in Selecting Core Compounds

In producing this 7-cylinder Diesel engine base, Stevens King Kore Kompound No. 2 was used to provide additional mold strength.

Stevens KING KORE KOMPOUND

Nos. 1 and 2

- KING KORE KOMPOUND, made in two grades, is a dry black powder—properly blended and thoroughly mixed—higher in bonding strength than ordinary pitch compounds. No. 1 melts with the heat of the core oven, giving dry strength to the core after cooling. No. 2 gives more strength to the core sand as moisture is added, thus green cores—before baking—can be easily handled.

- OPERATING COSTS ARE LOWERED by reducing the amount of new core sand needed for addition to the old, burnt sand and gangway sweepings. Less King Kore Kompound is required proportionate to the amount of sand.

KING KORE NO. 1—For use with cereal binders or for sand with good natural green bond. For sand low in green strength, temper sand with Glutrin or Molasses water.

- KING KORE NO. 2—The standard grade—contains the ingredients which provide green and dry strength. For use with sand of low green strength. Temper the sand with water only.

Select the grade best suited to your class of work, and order a barrel today.

"Everything for a Foundry"

There is a possibility that King Kore Kompound might prove to be an acceptable substitute for other core binders made of scarce or critical materials. Write us, describing your operating conditions, and we will try to make a recommendation.

FREDERIC B. STEVENS INCORPORATED

DETROIT · MICHIGAN

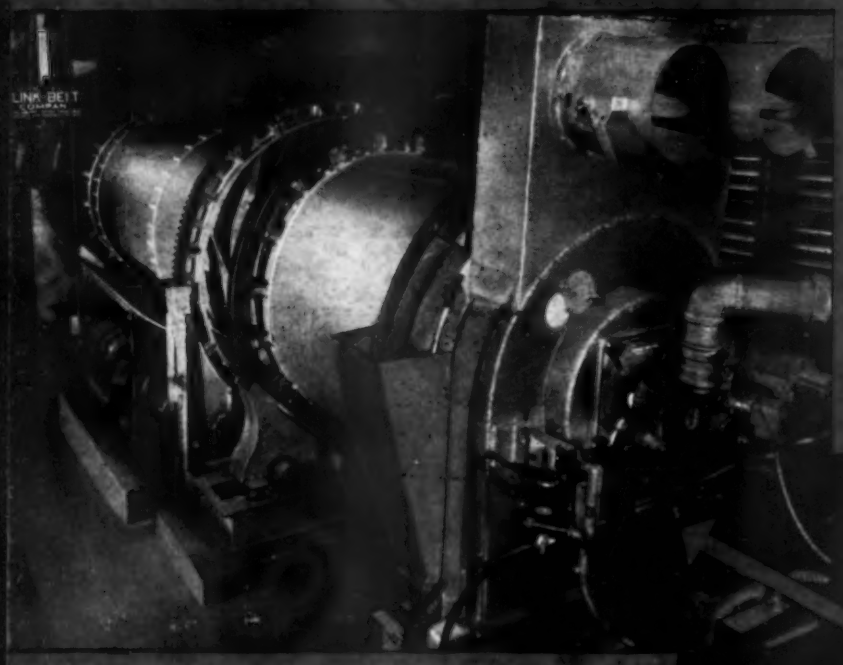
NEW ENGLAND . . . . . 166-182 Brewery St., New Haven, Conn.
NEW YORK and PENNSYLVANIA . . . . 93 Stone St., Buffalo, N. Y.
INDIANA . . . . Hoosier Supply Co., 36 S. Cruse St., Indianapolis, Ind.

• CANADA . . . . FREDERIC B. STEVENS OF CANADA, LIMITED
• 1262 McDougall St. . . . . Windsor, Ontario
• 2368 Dundas St. West . . . . . Toronto, Ontario

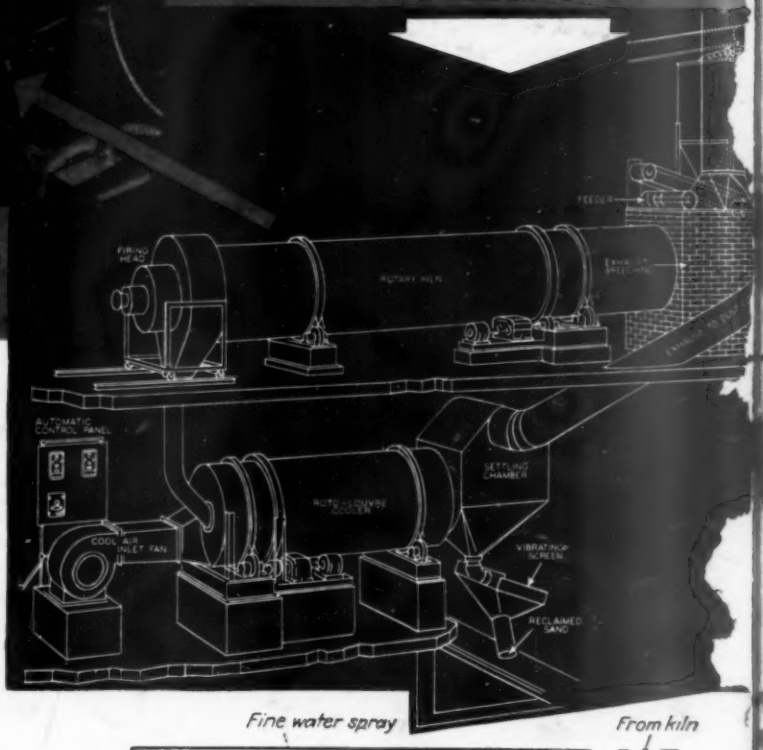
USED CORE SAND RESTORED LIKE NE

WITH THE

LINK-BELT THERMAL RECLAIMING SYSTEM



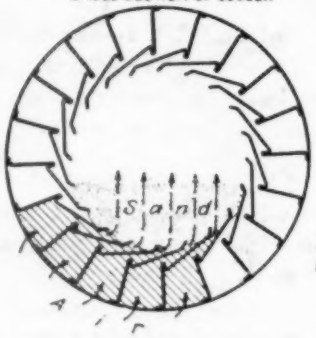
Above—View of revolving kiln from the firing end, showing oil burner. Sand enters the kiln at the far end.



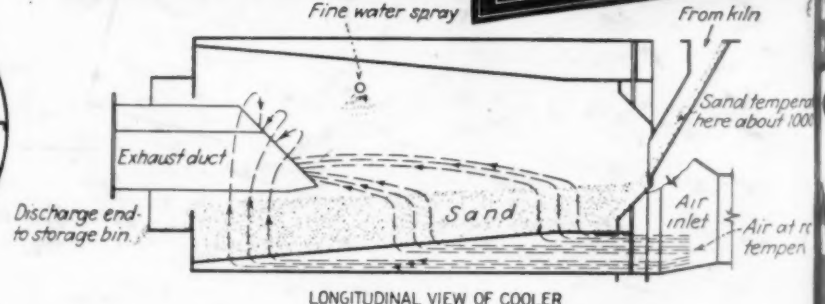
HOW IT WORKS

After the cores are granulated and screened the sand is passed through a rotary kiln, where it is exposed to temperatures above 1200° F. This removes binders, oils and similar foreign material. The cleaned sand is then cooled and classified in a Roto-Louvre cooler and is then ready for re-use.

CROSS SECTION OF COOLER



Hot sand falls by gravity from kiln discharge to Roto-Louvre cooler in which automatic controls regulate cooling and air classification to discharge a uniform product.



LONGITUDINAL VIEW OF COOLER

● Months of service in numerous war production foundries have proved the efficacy of this revolutionary method of reclaiming core sand. It renovates the used sand, restoring it to its original condition and color. Most tests taken under actual operating conditions show that cores made with sand reclaimed by this system have equal or better physical properties than cores made from new sand. As high as 80% recovery of used sand has been accomplished at a fraction of the cost of new sand with tremendous savings in manpower, railroad transportation and handling. Let us send you more detailed information.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, San Francisco 24, Toronto 8. Offices, warehouses and distributors in principal cities.

LINK-BELT Sand Preparation EQUIPMENT